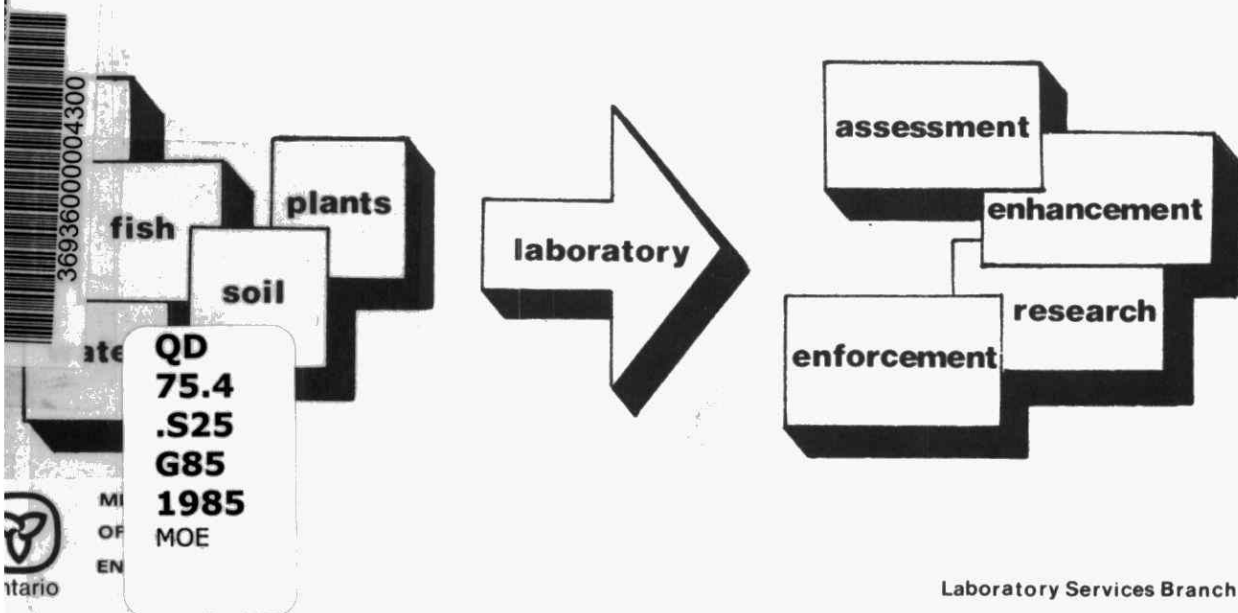


A GUIDE TO THE COLLECTION AND SUBMISSION OF SAMPLES FOR LABORATORY ANALYSIS



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A guide to the collection and
submission of samples for
laboratory analysis.

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**A GUIDE TO THE COLLECTION AND SUBMISSION
OF
SAMPLES FOR LABORATORY ANALYSIS**

FIFTH EDITION

Co-ordinated by
Water Quality Section
Laboratory Services Branch
Ontario Ministry of the Environment

July 1985.

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A GUIDE TO THE COLLECTION AND SUBMISSION OF SAMPLES FOR LABORATORY ANALYSIS

I INTRODUCTION

Sample collection is the first and often the most critical stage in the step by step procedure used to determine a substance or group of substances in the environment. From the standpoint of data interpretation, it is normally assumed that a representative sample has been taken. If the sample is not, in fact, representative, then this should be noted to avoid erroneous data interpretation. Similarly, once the sample has been collected, improper use of preservation techniques to stabilize the sample or delay in transportation may lead to questionable results.

In general, the sampler's aim must be to collect a representative sample from a known position (location) and transfer it to the laboratory with a minimal change in chemical composition of the parameter of interest. **It is of little value to make an accurate analysis of an incorrectly collected sample.**

A computerized sample entry and data processing system (LIS) is on-line at the Toronto Laboratory. All samples must be submitted to the laboratory with appropriate forms. Properly completed submissions (see Section IV SAMPLE SUBMISSION) will minimize confusion and delays in sample processing and hence subsequent lab analyses. Judicious selection of test codes will eliminate unwarranted and superfluous analyses. A final, careful cross-check of the sample, sample label, submission sheets and test requests before shipment should eliminate most errors which result in missing or useless data. Compared to sample collection, handling, and analysis, **the preparation of paperwork for sample submission takes little time but is a critical and unforgiving step.**

IT CANNOT BE EMPHASIZED TOO STRONGLY THAT THE SAMPLER PLAYS A KEY ROLE IN ENSURING THAT THE DATA OBTAINED REFLECTS THE FIELD SITUATION BEING ASSESSED.

The purpose of this guide is to outline the standard procedures required to collect and submit samples to the laboratory successfully. Selection of procedures depends on the types of sample and the analytical objectives. The sample type is fixed and will determine some of the sampling and analytical procedures. The analytical objectives are achieved by attention to specific sampling techniques, containers, sample volumes, preservatives, and submission procedures. Appendix I lists contact people for the various sections of the Branch. **You are strongly advised to discuss problems or large submissions with laboratory personnel before sampling.** Telephone numbers given in the guide are preceded by area code 416 unless otherwise specified. Table I provides a brief summary of tests offered by the Laboratory Services Branch (LSB). Table II provides specific information for most of these tests: container, preservation technique, minimum volume required, and comments. Tests performed by the Sediment and Soils Laboratory are described

separately in Table III. Ordering information for the containers is given in Table IV. Submission procedures are given in Section IV. Table V lists the contact persons forming the LIS/SIS (Laboratory Information System/Sample Information System) Regional/Branch Liaison Group. Section IV.A-VI contains the High Priority Submission Protocol, and Table VI lists the Emergency Response Task Force (ERTF) Representatives and Managers of the LSB, who must be contacted before submitting high priority samples. Appendix II gives the shipping addresses for the Central and Regional laboratories, and Appendix III provides specific details of the responsibilities of laboratory staff for legal samples.

LABORATORY SERVICES BRANCH

The various laboratories of the Laboratory Services Branch are equipped to perform a large number of chemical and microbiological analyses on domestic water supplies, surface waters, ground waters and domestic and industrial wastes. Fish, vegetation, soil samples, hi-vol filters, precipitation and snow samples are also analyzed by these laboratories. Special analyses can be provided for research studies or unusual pollution problems.

Decentralization of the Ontario Ministry of the Environment has resulted in the designation of six regions with boundaries as given in Figure 1. Three of these, the Northwestern, Southwestern, and Southeastern, have regional laboratories located at Thunder Bay, London and Kingston respectively. Samples collected within these regions are analyzed at the appropriate regional laboratory when analytical capability is available. When such capability is not available, these samples plus all those from the other three regions are analyzed at the Toronto Laboratory. The chemical tests performed by each regional laboratory as well as the Central laboratory in Toronto, are outlined in Table I. Field samplers should ensure that a laboratory is capable of analyzing the parameter(s) in question before shipping. Mobile laboratories and field stations are often provided to perform a limited number of tests in conjunction with major surveys or studies.

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II. SAFETY CONSIDERATIONS

A. OVERVIEW

1. All persons carrying out sampling activities should be familiar with the applicable sections of the Occupational Health and Safety Act 1978 and regulations for industrial establishments, in particular those sections dealing with safeguards, confined spaces, and personal protective equipment.
2. All staff carrying out sampling activities at an industrial establishment or pollution control plant should become familiar with the property, process, operation and associated hazards or be accompanied by plant personnel or another person who is aware of any potential hazards.
3. When sampling at manholes on streets or roadways where vehicle or pedestrian traffic may endanger the safety of any sampler, safeguards such as barriers, warning signs, traffic cones, vehicles equipped with flashing lights, fluorescent clothing, flag men or other safeguards deemed appropriate in the circumstances shall be used for the protection of all workers in the area.
4. Safety footwear shall be worn when removing manhole covers or when working in any area where a worker may be exposed to the hazard of foot injury.
5. When sampling potentially hazardous materials such as sewage, industrial waste, or contaminated soils, the sampler shall wear the appropriate protective equipment, i.e., rubber gloves and boots, face and respiratory protection as required. The re-entry period for pesticides shall be observed for areas which have been treated. Personnel shall observe the normal rules of basic hygiene, (i.e., wash hands and face, etc.) after sampling. Contaminated equipment and clothing shall be cleaned after each use.
6. There should be a minimum of two people present when sampling is potentially hazardous such as on slippery, steep, or icy creek and river banks, at street manholes, from any water craft or along any water way during hours of darkness. Work in confined spaces, such as down a manhole or wet well, requires additional precautions and equipment: gas detectors, safety harness, blower for purging, breathing apparatus, etc.
7. Potentially hazardous materials, (i.e., chemicals, contaminated samples) shall be protected against accidental breakage and spilling during transport. Sample bottles containing materials which may generate gases, (e.g., sludge), should not be more than half full to allow room for expansion. Potentially dangerous samples should be clearly labelled and marked "hazardous", (e.g. flammable, corrosive, toxic, explosive or radioactive) for the benefit of all persons who must subsequently handle the samples.
8. Caution should be observed in handling sampling boxes and chemicals such as preservatives. Rough handling which may cause undue agitation to samples and other containers should be avoided. Proper safe lifting techniques should be employed.

B. OCCUPATIONAL HEALTH AND SAFETY ACT 1978

SECTION 16.

1. A supervisor shall ensure that a worker,
 - a) works in the manner and with the protective devices, measures, and procedures required by this Act and the regulations, and
 - b) uses or wears the equipment, protective devices or clothing that his employer requires to be used or worn.
2. Without limiting the duty imposed by subsection 1, a supervisor shall,
 - a) advise a worker of the existence of any potential or actual danger to the health or safety of the worker of which the supervisor is aware;
 - b) where so prescribed, provide a worker with written instructions as to the measures and procedures to be taken for protection of the worker; and
 - c) take every precaution reasonable in the circumstances for the protection of a worker. 1978, c. 83, s. 16.

SECTION 17.

1. A worker shall,
 - a) work in compliance with the provisions of this Act and the regulations;
 - b) use or wear the equipment, protective devices or clothing that his employer requires to be used or worn;
 - c) report to his employer or supervisor the absence of or defect in any equipment or protective device of which he is aware and which may endanger himself or another worker;
 - d) report to his employer or supervisor any contravention of this Act or the regulations or the existence of any hazard of which he knows; and
 - e) where so prescribed, have, at the expense of the employer, such medical examinations, tests or x-rays, at such time or times and at such place or places prescribed.
2. No worker shall,
 - a) remove or make ineffective any protective device required by the regulations or by his employer, without providing an adequate temporary protective device and when the need for removing or making ineffective the protective device has ceased, the protective device shall be replaced immediately;
 - b) use or operate any equipment, machine, device or thing of work in a manner that may endanger himself or any other worker; or
 - c) engage in any prank, contest, feat of strength, unnecessary running or rough and boisterous conduct. 1978, c. 83, s. 17.

III SAMPLE COLLECTION

GENERAL CONSIDERATIONS

The success of an environmental sampling program depends on **the application of a well defined plan**. This chapter of the sampling guide is intended to assist in formulating plans for the collection of samples. The content is biased towards laboratory needs because of space limitations. Specific sampling procedures are described elsewhere (Maienthal and Becker 1976; Ontario Ministry of the Environment 1977; USEPA 1982; Environment Canada 1983). Scientists and engineers at the Laboratory Services Branch are available to help coordinate sampling and laboratory procedures (Appendix I).

The complexity of the sampling plan depends on the type of program: emergency (complaint), survey, monitoring, or experimental. Emergency or survey programs are usually "once only" operations, whereas monitoring and experimental programs are long term. Regardless of the type of program, a few general points and references can be given. The most common questions are: "Where to sample?" and "How many samples to collect?" As a rule of thumb, minimize sampling stations (choose these carefully) and **assure that sufficient samples were collected at each** to achieve the program goals. For monitoring or experimental programs, the number of samples required to achieve specified statistical confidence limits can be calculated (Bernstein and Zalinski 1983; Kratochvil 1983).

If sufficient samples are collected from appropriate sites, **the next major consideration is contamination**. This can occur at any stage: during sampling, handling, or laboratory analysis. One way of identifying a problem is to use "field blanks". These are samples containing a known amount of the substance of interest which are handled in the field and analyzed at the laboratory identically to normal samples. If no significant change is found, it means that contamination is not important in the chosen analytical range. The check for contamination should be repeated periodically, especially when the analytical range is changed to be more sensitive. If contamination is significant, then the source must be identified and eliminated if possible.

Aside from contamination by the substance of interest, **the presence of other substances may lead to "matrix" problems at the analytical stage**. Matrix problems may be apparent to samplers only when they are extreme. For example, if the sample is difficult and unpleasant to collect (such as some industrial wastes and leachates), it will probably be difficult and unpleasant to analyze. For complex mixtures or unusual test requests it is best to consult the laboratory staff as early as possible. In many cases a clear understanding of what analyses can or cannot be performed will determine the sampling protocol and sample preparation for submission. It is unsatisfactory for everyone when the final data report contains the remark "unsuitable for analysis". Equally unsatisfactory is the failure to request appropriate tests according to the type of sample and original goals of the sampling program. In either case, the omission will not be identified until weeks after the sample was submitted. Thus prevention is the only cure.

Other sampling considerations include **the choice of containers, preservative and storage for samples**. Tables to assist in this choice are provided. Finally, planners and samplers should consult other Ministry publications such as Outlines of Analytical Methods,

1981, for details of analytical ranges, parameters detected by method, possible interferences (matrix effects) and the average precision.

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1. Bernstein, B.B. and J. Zalinski. 1983. An optimum sampling design and power tests for environmental biologists. J. Environ. Management 16:35-43
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3. Kratochvil, B. 1983. Statistical considerations in sampling for chemical analysis of the environment. In: Proc. of ACS Symposium: Role of Chemometrics in Pesticide/Environmental Residue Analytical Determinations. ACS, Seattle, WA. March 1983.
4. Maienthal, E.J. and D.A. Becker. 1976. A survey on current literature on sampling, sample handling, for environmental materials and long term storage. Interface 5:49-62.
5. Ontario Ministry of the Environment. 1977. Primary treatment and sludge digestion workshop. Pollution Control Branch.
6. Ontario Ministry of the Environment 1981. Outlines of analytical methods. Laboratory Services and Applied Research Branch.
7. USEPA 1982. Handbook for sampling and sample preservation in water and wastewater. U.S. Environ. Monitoring and Support Lab., Cincinnati, Ohio. EPA-600/4-82-029.

A. SAMPLE COLLECTION FOR WATER QUALITY ASSESSMENT

A - I SAMPLE COLLECTION FOR CHEMICAL ANALYSIS

1. GENERAL CONSIDERATIONS

The method of sample collection in the field is the responsibility of the individual involved. The following points should be noted:

- a) The sample must be truly representative of the whole.
- b) All possible sources of sample contamination (sampling devices, motor exhausts, disturbing of bottom sediments, use of inappropriate containers, etc.) should be eliminated or reduced to a minimal level.
- c) Since sample composition will change with time, rapid transportation to the laboratory is desirable. For some parameters, use of a preservative is recommended. Theoretically, this should fix the concentration of the parameter of interest and reduce the need for rapid transport and analysis (See Section A-I Part 3). However, in practice this only delays the perishability of the parameter and the sample should still be transported as quickly as possible.
- d) For samples which do not have a preservative already in the collection bottle, rinsing both the bottle and cap with sample (two or three times) is strongly recommended. This procedure, while reducing any contamination that may be present, also tends to equilibrate the sample with the container walls and hence "container effects" (leaching, adsorption, etc.) are minimized. Sampling for organics is an exception since repeated rinsing may concentrate the compounds on the walls of the container.

2. SAMPLE CONTAINERS

In general, surface water samples are collected in 1 liter glass bottles (*under review at time of printing), but some analyses require special plastic containers or glass tubes. Table II summarizes the proper sample container for each parameter and Table IV lists the containers available from Central Stores. Selection of containers is also determined by sample volume required (see #4 below). Note for instance that low level nutrients must be submitted in polystyrene containers only*. Special studies may require a certain container type or sample pretreatment during sample collection. It is the responsibility of the sampler to obtain the proper sample container for special studies or special analytical requests.

Precipitation sampling should be conducted using sample collectors designed to catch precipitation as it falls (e.g. Sangamo, Aerochemetric, etc.). Once the sample has been collected it is transferred to polystyrene

bottles. Usually the sample is collected directly in a polyethylene bag inserted in the collector. This bag must be completely sealed before shipping to the laboratory. Special acid washed polyethylene or new (unwashed) polystyrene containers are required for trace level metal analysis.

Sludge samples are collected in wide mouth glass or plastic bottles and never filled more than half way. The extra space is required as an expansion zone for gaseous products that may be formed. Failure to submit samples in this manner may result in container explosion during transit or at the laboratory. Overfilled sludge samples are discarded without analysis. Sludge samples for trace organic contaminant analysis must have a foil lined cap.

For trace level metal analysis on surface and domestic waters, special acid washed polyethylene or new (unwashed) polystyrene containers are required. Standard glass containers with non-metal cap liners should be utilized for all other routine water samples requiring metal determinations.

Analysis for filtered total phosphorus requires a field filtered sample collected in a special prewashed, precalibrated culture tube that is provided by the laboratory (Rivers and Lakes Laboratory, Water Quality Section, 248-3512).

Note that samples submitted for physical testing such as particle identification (see Section D-III) or microbiological analysis are generally unsuitable for chemical analysis and vice versa. An appropriate separate bottle should be submitted for each of these test types when more than one is required.

Aqueous samples for the analysis of organic contaminants should be submitted in new 1 liter glass bottles with foil or Teflon lined caps. Generally, the sample should have no head space and should be refrigerated. Care should be taken to avoid freezing the sample. If analysis of hydrocarbon gases is required, approximately 20% head space should be provided. The sample should not contact anything but Teflon, glass, aluminum foil, or stainless steel. Avoid contact and contamination of samples with rubber or plastic gloves.

PCB and pesticide samples must be collected in new 1 liter glass bottles that have been previously rinsed with methylene chloride followed by acetone and baked at 300°C. These specialized containers are prepared and marked at the laboratory. Do not fill these special containers above the indicated level.

3. PRESERVATION TECHNIQUES

The function of a preservative is to stabilize the parameter of interest so that changes in composition during transit and the time prior to analysis are minimized. Several different preservation methods are recommended and these are outlined by parameter in Table II.

Preservation techniques usually involve the addition of a chemical which "ties up" the parameter in a form which is unaffected by sample ageing or else provides conditions unsuitable for any further reaction to occur. In some cases, refrigeration or freezing to reduce reaction rates provides the best preservation, particularly for those parameters which have a direct biological relationship (i.e. with respect to growth or decline, for example, nutrients). Preservation for some parameters is effective, for others it serves only as a technique to marginally reduce the decay or conversion rate. Therefore, it is imperative for such parameters as phenol, chlorophyll etc., that every effort be made to submit the samples to the appropriate laboratory as quickly as possible to avoid or reduce loss.

The sampler should be aware that the use of the recommended preservative for one parameter may negate the possible analysis of another. For example, heavy metal samples preserved with nitric acid are unsuitable for nutrient analyses. It is the sampler's responsibility to determine whether use of a certain preservative will eliminate the possibility of analysis of another requested parameter, and provide suitable replicate samples to avoid the problem. If in doubt, consultation with laboratory staff is advised (Appendix I). Each replicate should have the preservative used clearly marked on the bottle label.

4. SAMPLE VOLUME

The analytical methods used to determine parameter concentrations require a certain minimum volume of sample in each case, as outlined in Table II. The field sampler is expected to calculate the total volume of sample required by summing the specified individual volumes (Table II) for all the analyses requested and to submit the appropriate quantity. In addition, samplers are asked to submit **at least 20% of sample in excess** of their original total estimate, if available, to allow for possible repeat analysis. Failure to provide the required sample volume will normally result in an "insufficient sample" remark being entered on the analysis report sheets.

In most cases, the volume required for analysis depends on parameter concentration, with "clean" samples (i.e. low concentrations) needing the largest amounts. Domestic water supplies, well waters, and unpolluted surface waters fall in this category. Tests for these sample types require the largest practical volume in order to provide a sufficient quantity of the substance of interest for reliable detection. Samples of high concentration (effluents, sewages, etc.) require a much smaller amount, and even a dilution may be employed. **Submission of excessive quantities of noxious, toxic, or hazardous wastes creates serious safety and disposal problems at the laboratory.** If in doubt, contact laboratory personnel.

In certain cases where the sampler is unable to obtain sufficient sample volume or when resampling is impossible, analysis may still be obtained if special care and analytical techniques are used in the laboratory. This can only be achieved after consultation with laboratory personnel has been initiated by the sampler and before sample submission.

5. SAMPLING METHODOLOGY

The sampler should be aware of how the particular details of his procedure (geographic location, time of day, method of obtaining the aliquot, etc.) may bias the results which are eventually obtained.

Care should always be taken to minimize sample cross-contamination by carefully rinsing (with sample) all sampling equipment used in collecting the aliquot which is sent to the laboratory. When rinsing is not possible such as in precipitation sampling or sampling for organics, the contamination of samples by the collecting vessel or polyethylene bag should be checked regularly. These precautions are particularly important for low concentration parameters.

When sampling for volatile organics and trihalomethanes, the bottle should be tilted and filled slowly to prevent bubbling.

6. FIELD RECORDS

It is in the sampler's own interest to keep complete records of his sample collection activity not only from the standpoint of date, sample number, location, description, etc., but also with regard to unusual features which may be extremely useful in interpreting the analytical data. This information may also prove invaluable in the event of sample loss, misnumbering of sample bottles or report sheets, etc.

A - II SAMPLE COLLECTION FOR MICROBIOLOGICAL TESTING

1. GENERAL CONSIDERATIONS

It is the responsibility of the sampler to use aseptic techniques when handling the sterile bottles used for microbiological sample collection. Failure to do so will result in sample contamination and meaningless results. It is recommended that the techniques described below be closely followed in order to obtain reliable data.

2. MICROBIOLOGY PARAMETERS

Table I lists the microbiological parameters performed in each laboratory with specific parameter information given in Table II. If the pollution sources are complex and/or there is doubt as to the most appropriate selection of bacterial parameters, then the Microbiology staff should be contacted.

3. SAMPLE CONTAINERS

Presterilized 250 mL bottles with red labels usually provide adequate volume (200 mL) for routine analyses. It is particularly important that chlorinated waters or waters in which a chlorine residual is suspected, should be sampled in presterilized 250 mL bottles containing sodium thiosulphate (red label).

Before samples are collected for sulphur cycle bacterial analyses, the Microbiology Section should be contacted to determine whether thiosulphate should be used or not.

Samples collected at depth, are taken using sterile sampling bulbs which can be obtained from the Microbiology Section in Toronto.

4. PRESERVATION TECHNIQUES

Sodium thiosulphate is used to neutralize the disinfecting properties of chlorine thereby preserving the existing microbial population at the time of sampling. This preservative is already present in the red labelled sample bottles. Keep samples cool, preferably through refrigeration or ice, and away from light during transportation to the laboratory. Frozen samples will not be accepted.

5. SAMPLE VOLUME

In general, one bottle or bulb per sample provides sufficient volume for standard analyses. If, however, the bacterial levels expected are very low or extra parameters are being requested, then additional samples may be required. Consultation with Microbiology staff is advisable in such cases.

6. SAMPLING METHODS

Sterile sampling bottles are available through Central Stores in Toronto, and regional laboratories. For special studies, alternate bottles are obtainable through Microbiology staff on consultation. Samplers should check to see if the plastic seal on each container is intact before sampling. Containers with loose or cracked seals should not be used. All samples should be collected early in the week and shipped to the appropriate laboratory. During spring, summer and fall, samples should be packed in ice to minimize biological activity. In winter, samples should be packed in insulating material to prevent freezing while still keeping them cold. Immediate delivery to the laboratory is essential. Analysis within six hours is preferable, and should not be conducted after twenty-four hours.

Strict adherence to the following sampling procedures is recommended:

a) Surface Water Samples

Clamp the bottle onto a sampling pole before removing the cap. Touch only the outer surface of the cap when opening the bottle. The inner lip of the bottle and cap liner must not come in contact with anything except the atmosphere. If they are accidentally touched, the sample has been contaminated and should not be submitted. The recommended procedure is to hold the cap with your fingertips until the sample has been taken. The cap must not be set down somewhere while the sample is being taken as this will result in contamination.

Surface sampling from a river or stream is accomplished by quickly lowering the sample bottle into the water approximately one meter below the surface with the mouth facing into the current. When sampling near shore, care should be taken to get a sample uncontaminated with sediment. When bubbles are no longer observed coming from the bottle, the bottle is then removed from the water, the water level adjusted to the top of the label, and the bottle is immediately recapped before unclamping it from the sampling pole. Samples must be collected using this prescribed technique. The use of a dipper, a sampler with a sideholder for bottles, or other sampling device will result in contamination.

b) Water Samples Below Surface

Depth samples are taken using sterile sampling bulbs. Bulbs should be used as quickly as possible: if not used, they should be returned to Microbiology staff within a maximum of two weeks, otherwise, the rubber will crack and the bulb will not open. The same care that is used with sampling bottles must be used in the handling of bulbs. The glass plugs supplied have been sterilized within a cellophane envelope and must not come in contact with any contaminated surfaces when they are being removed from the cellophane envelope. If, for some reason, the sampler should run out of glass rods, he may dip the metal plug into alcohol and flame it. After flaming, the plug is immediately inserted into the bulb, taking the usual precautions when handling sterile equipment. The use of the metal plug is discouraged and it should only be used in rare instances when the sample could not possibly be obtained at a later time in the correct manner.

c) Tap Water Samples

Samples from taps must be taken only after aerators, screens, hoses, etc., have been removed. Prior to sampling from a tap, the water should be allowed to run at full flow for approximately two minutes. The strong flow will clean out residual contamination around the orifice of the tap thus ensuring a more representative sample. The water pressure should then be reduced to permit taking the sample without excessive splashing which could result in contamination of the sample.

Fill the bottle to the top of the label being certain that the mouth of the bottle does not come in contact with the tap or any contaminated surface. The cap must also be handled aseptically as described previously.

d) Sample Duplication

Duplicate samples should be collected simultaneously. This can be achieved for surface samples by clamping two bottles on a sampling pole, and for depth samples by placing two bulb samples on the sampling line in a "piggy-back" fashion.

A - III SAMPLING FOR ASBESTIFORM MINERAL FIBRES

Asbestos determination involves a time consuming electron microscopic inspection. The extreme care and time required for this analysis make the test very costly, and very long sample back-logs are common. For these reasons no sample should be submitted without previous consultation with the Electron Microscopy personnel.

Details for collecting samples are given in "Asbestos sampling procedures", Ontario Ministry of the Environment, Technical note 7017. Water samples should be collected in a 1 liter plastic bottle. Only new bottles should be used. The usual precautions of multiple bottle rinsing, rapid transport to the laboratory etc., are of particular importance for the collection of asbestiform mineral fibre samples. Samples should be sent to the Electron Microscopy Unit, Inorganic Trace Contaminants Section, MOE, Resources Road, accompanied with the sample submission form.

A - IV SAMPLING FALLING RAIN OR SNOW, AND DRY DEPOSITION

1. DAILY SAMPLES

a) Wet Deposition

Event samples are collected in disposable plastic bags, which have been inserted into the bucket of a "wet-only" type automatic collecting device and exposed over a 24 hour period. The samples collected in the bags are transferred to polystyrene containers for routine chemical analysis and the volumes are measured by weighing.

For the months during which snow is expected (November through April), the Aerochemetric deposition collector is replaced by a sampler known as the Sudbury Environmental Study (SES) -type collector. This collector consists of a large-mouth (diameter 47 cm) bucket with a polyethylene bag insert. The bag is replaced daily so that each sample actually represents a 24-hour bulk measurement rather than a true wet-only measurement. Because of the snow cover and the stringent site selection criteria applied, it is

expected that dry deposition would be minimal. Each SES-type collector is accompanied by a standard nipher-shielded snow gauge similar to that used by the Atmospheric Environment Service. This latter gauge provides an accurate daily measurement of snow depth.

b) Dry Deposition

The instrumentation to measure daily dry deposition consists of an air filtration system for the measurement of ambient concentrations of sulphur and nitrogen compounds.

Nine filter packs (one per day, one passive and one spare) are mounted at the top of a 10 m tower once per week. The filter packs used in the network are modified 'Swinnex' two-stage, 47 mm, polypropylene units manufactured by Millipore Corporation. Each filter pack samples for 24 hours (commencing at 0700 EST) at a flow rate of 25 litres per minute. This flow rate is maintained by a Gast, heavy-duty diaphragm pump and is controlled by a Metrex Instruments Ltd. SAS8-25 Sequential Air Sampler.

Individual filter packs are loaded with 3 types of filters, each type specific for certain pollutants. The upstream filter is a Membrana (Ghia) Corporation 47 mm diameter, 2 μ m pore size Teflon filter which collects particulate sulphate, nitrate and ammonium. The Teflon filter is followed by a Membrana (Ghia) Corporation 47 mm, 1 μ m nylon filter, used for the selective absorption of vapor phase nitric acid. Both filters are loaded in the upstream stage of the filter pack and are in direct contact with each other.

The final filter is a 50 mm Whatman 41 cellulose filter impregnated with a potassium carbonate/glycerol solution. This impregnating solution selectively absorbs sulphur dioxide (SO_2). Two of these filters are loaded in the downstream stage of the filter pack and are also in direct contact.

The filter pack sampling therefore provides daily measurements of particulate-phase sulphate, nitrate and ammonium as well as vapour phase nitric acid and sulphur dioxide. There is some evidence that the speciation of the nitrogen compounds using this type of selective sampling is subject to errors because of absorption, desorption and volatility properties of the compounds. It is felt, however, that the summation of the NO_3 and HNO_3 on the Teflon and nylon filters (respectively) is an accurate measurement of total ambient nitrates.

2. LONG TERM SAMPLES

a) Wet Deposition

Long term sampling is conducted over periods of several weeks to a month. Samples are collected using Sangamo, M.I.C., or Earth Sciences samplers, which are automatically activated during precipitation events and are closed all other times. A portion of each sample is transferred to a 60 mL polyethylene container

and preserved with 0.5 mL concentrated nitric acid. Polystyrene containers are used for routine chemical analyses. Polystyrene or polyethylene containers are used for metal analyses.

A secondary type of sampler (a plastic bin with polyethylene liner) which is continually open may be used for bulk sample collection, i.e. precipitation and particulate matter. Normally it is the responsibility of the field sampler to determine the total volume collected and to transfer the precipitation samples to appropriate containers before submitting them to the laboratory for analysis. Snow samples are thawed at room temperature prior to quantitative transfer into plastic or glass bottles. Once in the bottles, the sample should be handled in the same manner, with regard to storage, preservation, shipping, etc., as other water samples.

b) Dry Deposition

The long-term ambient sampler used to estimate dry deposition is a Metrex Instrument Ltd. AS-2 Low-Volume Air Sampler. The basic features of the instrument are: i) a vacuum system controlled by a Gast heavy-duty diaphragm pump, in which the flow rate is controlled by a Dwyer Instruments VFA23 rotameter; ii) a temperature-compensated dry gas meter which facilitates accurate monitoring of the flow and; iii) digital counters which record associated total volumetric flow and operating time.

The pumping system is used in conjunction with a modified 'Swinex' two-stage, 47 mm polypropylene filter pack mounted on a 2 m tower. The filter pack samples for 28 days (commencing at 0800h local time) at a flow rate of 2.0 litres per minute. Vacuum Tygon tubing connects the filter pack (mounted on a filter pack support plate and enclosed in a protective housing) to the pumping system.

The filter pack samples of this network are obtained at the same time as the wet bag collection, i.e. on designated dates every 28 days at 0800 hours local time. The sampling protocol is as follows: prior to an upcoming sampling changeover date, an unexposed filter pack is loaded with Whatman 40, Nylon and K₂CO₃-glycerol impregnated Whatman 41 filters, sealed in a 'Whirl-Pak' polyethylene bag, then either shipped or taken to the sampling site. At the site, the low-volume sampler is shut-off and the associated flow rate, flow volume and total time sampled are recorded on operator field sheets. The exposed filter pack is covered with a new 'Whirl-Pak' bag, twisted off the threaded nylon support plate and the bag sealed. The reverse of this procedure is carried out to mount the new unexposed filter pack. The digital counters on the low-volume sample are reset to zero and the instrument is switched on to commence sampling.

Upon receipt at the regional MOE office, the filter packs are unloaded. The Whatman 40 filter is laid flat and stored in a small Petri container, while the nylon and Whatman 41 filters are stored in 'Whirl-Pak' bags. All filters are labelled and then submitted to the Laboratory Services Branch for chemical analyses.

A - V SNOW-COVER SAMPLING

1. GENERAL CONSIDERATIONS

A snow sampling survey should be designed to provide an adequate number of sample points to cover the area of interest. Sample sites should be in undisturbed locations, away from roads or other local sources of contamination, sufficiently open to permit the free fall of snow but not exposed to excessive drifting. Two control samples, remote from any known source of contamination are recommended for each investigation. To avoid contamination from dead vegetation or other matter near the ground, snow sampling should preferably be undertaken only when the total depth of snow exceeds 25 cm. The quantity of snow required for analysis will depend upon the types of parameters requested. Generally, sufficient snow to yield 2 L of meltwater is adequate.

2. SAMPLE COLLECTION

Samples are collected by means of a plastic cylinder, i.e. a dustfall jar with bottom removed, or similar device which has been shown to be contamination free for the parameters of interest (i.e. no metallic parts if metal analyses are required). The cylinder should be of sufficient size to accommodate the expected total depth of snow. Insert the cylinder into the snow to the required depth, clear the snow from around one side of the cylinder and raise the cylinder about 5 to 10 cm off the ground. Insert a hard, clean plastic plate under the base of the cylinder and remove cylinder and contents. Transfer the collected snow into clean heavy gauge polyethylene bags and retain in unmelted condition until ready for processing. Record the number of cores obtained at each site, total depth of snow, surface area sampled, the kind and amount of visible surface and subsurface contaminants. Duplicate samples are collected at each site to avoid data loss and to assist in interpreting any anomalous results.

3. SAMPLE PROCESSING

The sample material is transferred to a second clean polyethylene bag, placed in a plastic pail and allowed to melt in the bag (usually 12 - 18 hours). The volume of meltwater is measured, by weighing the sample in the plastic bag (allowing for the tare weight of the bag). After vigorous mixing, to ensure uniform distribution of particulate matter, appropriate aliquots are poured into sample containers, depending upon the type of analysis and preservation treatment required. For most analyses, polystyrene bottles are suitable for sample submission.

A - VI GROUND-WATER SAMPLING

1. GENERAL CONSIDERATIONS.

- a) The selection of a sampling procedure should be preceded by specifying the objectives of the study and the factors which influence ground-water quality.
- b) The minimum number of parameters to achieve the objectives should be chosen.
- c) The sampler should take appropriate steps to obtain representative samples of ground-water.
- d) The analysis of certain physical and chemical parameters in the field is required. The determination of parameters such as temperature, pH, alkalinity, conductivity, and dissolved gases, etc., should be carried out in the field because changes in the sample may occur before analysis at the Laboratory.
- e) For each sampling point, the sampler should keep a record of sampling conditions. For example a description of well location, depth, construction static level, number of well volumes evacuated, details of sampling method and equipment and any other relevant points.

2. SAMPLE COLLECTION

Most of the comments in Section A-I regarding sample collection for chemical analysis are applicable to ground-water samples. The procedure for sample collection and treatment for specific analyses follow.

- a) Major Inorganic Ions and Trace Element Ions.
Some studies may require the samples to be filtered in the field. Filtration through a 0.45 μ m membrane filter is desirable before preservation and/or analysis to exclude any undissolved (suspended) material present at the sample source. If field filtration is not possible, refrigerate and filter sample within 24 hours. Following filtration, samples to be analyzed for major inorganic anions should be preserved by refrigeration. Samples for cation analysis should be placed in polystyrene or special acid-washed polyethylene containers, and preserved with HNO_3 (Table II).

The filtration of clean ground-water samples may not be necessary. However, these samples should be preserved as indicated above.

- b) Dissolved Gases.
Ground waters may contain CO_2 , O_2 and N_2 , CH_4 and H_2S which are derived from biochemical processes, and organic gases resulting from contamination.

Where a field determination of the dissolved gases is impractical, special sampling and storage techniques are required. Samples should be collected in hard glass, chemically resistant bottles. The bottle is filled to the top with no air space remaining beneath the cap. The bottled sample should be kept at a temperature slightly lower than that at which the water was collected.

To sample gases released from ground water samples, water is displaced from an inverted calibrated glass tube which is submerged in a larger container which receives water from a pumped discharge line at a known flow rate. The glass tube is sealed under water with a special cap containing a septum, and the sample is preserved by refrigeration.

3. RECOMMENDATION

Investigators are advised to discuss the objective of each study with the Regional Hydrologist. The Hydrologist can assist in designing the sampling program and suggest practical procedures for the collection of ground-water samples.

4. NOTE

It is essential that copies of all landfill submissions be given the additional client code CLT01, so that submission and analytical reports will be available in one location for the use of LSB. All samplers are instructed to attach this client code to all submissions using the 04 series of program codes, and also to all other submissions associated with landfill monitoring when other program codes are used. G. Hendry of LSB will be coordinating these submissions (248 3846).

A - VII CHEMICAL AND PHYSICAL FIELD ANALYSIS

The perishability of some parameters for which no chemical preservative is suitable necessitates field measurement. In the case of major field studies, a field laboratory facility for this purpose may be warranted. For example, such parameters as dissolved oxygen, dissolved carbon dioxide, free chlorine, chloramines, hydrogen sulphide and temperature are extremely perishable so on-site analysis is recommended. Temperature and dissolved oxygen are conveniently measured using electrode sensors (and/or Winkler titration for dissolved oxygen) while dissolved carbon dioxide, free chlorine, chloramines, and hydrogen sulphide require more complex analytical techniques. Prior consultation with the Laboratory Services Branch, Water Quality staff, is recommended in these cases.

B. SAMPLE COLLECTION FOR AIR QUALITY ASSESSMENT

B - I GENERAL CONSIDERATIONS

The reliability of final results reflects the care and procedure used to collect samples. The sampler should ensure that samples collected for air quality assessment are representative of the whole and that all possible sources of sample contamination are either eliminated or minimized. Since in some cases, specialized routine and non-routine techniques are involved in sample collection, the sampler is advised to consult laboratory personnel (Appendix I) prior to initiating a survey. Information provided should include sampling locations, frequency, analytical requirements, etc. A written outline of the sampling survey should also be provided. Refer to the specific sampling technique below for information regarding the best way of transporting samples to the laboratory.

Testing capabilities are outlined in Table I, with specific parameter information given in Table II.

B - II ROUTINE TECHNIQUES

1. CONTINUOUS AIR MONITORS

Sulphur dioxide, oxides of nitrogen, ozone, carbon monoxide, and reactive hydrocarbons are the pollutants that are regularly monitored on a continuous basis as part of the air monitoring program in Ontario. Each region is responsible for maintaining and calibrating its own monitors.

Instruments have also been developed for other pollutants such as hydrogen sulphide, fluorides, vinyl chloride, mercury, respirable and non-respirable particulate matter.

Sequential filtration samplers are also used to measure the soiling property of ambient air in co-efficient of haze units. The air sample is drawn through a paper tape on which the particulate matter is deposited. The period of sampling is variable between one to two hours. The deposit can be analyzed for lead, calcium, and iron.

Continuous air monitors are the best means of sampling and analyzing gaseous pollutants because the effects of handling and perishability are minimized by direct introduction of the sample into the instrument. This technique is expensive, requiring a heated shelter equipped with power and trained technicians to calibrate and maintain instruments on a regular and frequent basis.

2. DUSTFALL SAMPLING

A clean sealed polyethylene dustfall collector jar (30 cm tall x 15 cm diameter) containing a polyethylene insert, identified by station number, is attached to a suitable supporting bracket, uncovered, and allowed to collect settleable particulate matter over a one month period. Collectors are located to provide dustfall samples that are representative of the area being studied.

Each collector should have a clear field of exposure, free from interferences such as buildings or other high objects or structures. Accessibility and security are other considerations in site selection.

The top of the container should be a minimum of 1 and a maximum of 5 meters above the ground and at least 1.5 meters above any other surface in the vicinity. Attachment to hydro poles is a common method of support.

During summer, an aqueous solution containing 1 mg/L of CuSO_4 may be added as an algal and fungal inhibitor provided that these substances will not affect the desired analysis. A dustfall collector containing two liters of the above solution tends to reduce loss of particulate matter by the action of wind currents. The use of "wet" collectors is not universal, and consultation with laboratory staff is recommended prior to their use.

It is important to establish the down-wind direction from the source being investigated and position the dustfall collector accordingly. After one exposure period the collector should be removed, capped and taken to the laboratory for analysis. Since the collector must be kept in an upright position, shipping by CN, CP, etc. is not recommended.

It is very important that a record of station number and installation and removal dates accompany the collector since this information is necessary to calculate the results.

3. HI-VOL FILTER SAMPLING

The collection of suspended particulate matter involves filtration of air through a 20 cm x 25 cm (8" x 10") glass fibre filter using a vacuum pump capable of drawing at least $1.3 \text{ m}^3/\text{min}$. The normal sampling period is 24 hours. A complete description of the Hi-Vol sampling device and procedure may be obtained from the ASTM publication, Gaseous Fuels; Coal and Coke; Atmospheric Analysis, Part 26, November 1980.

The sampler consists of a face plate, gasket and retaining ring, a filter adapter assembly, and a vacuum pump. The sampler is mounted vertically within a protective shelter. With the pump drawing $1.7 \text{ m}^3/\text{min}$, the louvered shelter will only allow suspended particulate matter up to about 100 μm (aerodynamic diameter) to reach the filter. Pre-weighed and coded glass fibre filters and protective envelopes are available from the Air Quality

Unit, Inorganic Trace Contaminants Section, for use with these samplers. The filter must be carefully installed (rough side upwards) on the sampler, and the coded number recorded on the envelope. Ripped or punctured filters must be discarded. If difficulty is encountered due to wind, it may help to switch on the motor, thus holding down the filter while it is being secured by the frame. Preloaded cassettes have been found to be a useful method of replacing the glass fibre filter. The collection surface of the filter should not be touched at any time. Once the sampler has been prepared, the motor should be switched on and the air flow measured using the orifice manometer and the reading recorded on the envelope together with the preset time for start up.

The operator should then shut down the pump and reset the timer. The pump will then automatically start up and run for twenty-four hours (midnight to midnight). Once the sample has been collected, and before the filter is removed, the pump should be momentarily switched on and the final air-flow reading recorded as well as the day on which the filter was exposed. After carefully removing the filter, fold it in half along the 20 cm width, particulate side inwards and place in the corresponding envelope. Any comments peculiar to the sampling conditions should be noted. This is important for data evaluation.

The filter should be mailed to the Air Quality Unit, Inorganic Trace Contaminants Section, along with the calculated air volume. Hi-Vol filters for the Northwestern Region are obtained from and sent to the Regional Laboratory in Thunder Bay.

Analysis of nonvolatile organic contaminants, such as benzo-a-pyrene (BaP), benzo-k-fluoranthene (BkF), polycyclic-aromatic-hydrocarbons (PAH), and benzene soluble organics, may be performed on subsamples from the Hi-Vol filters. Field sampling instructions in this regard are the same as above. These filters should be kept protected in envelopes and not be exposed to heat or sunlight.

Certain tests for inorganics are incompatible with the glass fibre filters normally used. These include: Al, Ba, B, Ca, Na, K, Si and F. For these elements, polystyrene (Delbag) filters are recommended and are available from the Air Quality Unit.

Note that total suspended particulates and organic contaminants cannot be determined on Delbag filters. In summary, the filter envelope must contain the following information:

- i) Station number (i.e. sampling location)
- ii) Hi-Vol instrument number, date and time of exposure
- iii) Filter number
- iv) Operator

- v) Flow readings at start-up and shut-down
- vi) Comments regarding incidents peculiar to the sampling period.
- vii) Air volume (m^3).

4. SAMPLING FOR ASBESTIFORM MINERAL FIBRES

The analytical technique for the determination of asbestiform fibres in air involves a time consuming electron microscopic examination of the processed samples. The expertise, time and instrumentation required for this analysis make the test very costly. For these reasons, sampler discretion regarding submission of samples is requested. Every attempt should be made to preserve the integrity of the sample.

Asbestiform minerals as suspended air particulates are collected on a 0.4 μm pore size Nuclepore filter using a modified Hi-Vol sampler. The modification consists of installing a flange with a 2 cm diameter opening on the air exit of the sampler. This opening acts as a limiting orifice and brings the air flow rate into a suitable measurement range. It is recommended that the Hi-Vol sampler be equipped with a transducer and an air flow rate recorder. The sampler must be recalibrated after the modifications have been performed. Procedures for calibration may be obtained from the laboratory or from the Technical Support Group, Central Region, telephone 424-3000.

It is very difficult to change the filter in the field and preinstallation of the filter in the Hi-Vol cassette inside an enclosed area is recommended. The entire cassette assembly is then attached to the air sampler. Removal of the filter should be performed in the reverse order.

After exposure, the filter is removed from the cassette, placed on the 20 x 25 cm separator sheet supplied with the filter and both are then folded along the 20 cm width. The folded filter and separator are placed within a glassine envelope and mailed to the laboratory in the usual kraft paper Hi-Vol envelope, together with all pertinent sampling data. Samples requiring asbestos analysis should be sent to the Electron Microscopy Unit.

5. FLUORIDATION AND SULPHATION RATES

Fluoridation rates are measured using the appropriate candles or plates, while sulphation rates are measured using the appropriate plate. These devices may be obtained from the Inorganic Trace Contaminants Section. Protective shelters are provided and installed by the regional staff. The stations should be located between 3 and 5 meters off the ground, and should be isolated from any obvious local interferences. The candle or plate should be removed from its protective cover and placed over the peg inside the candle cage or in the plate

holder. Normal exposure time is thirty days. The exposed candle or plate should be carefully replaced in its protective cover, placed in its shipping container and sent to the LSB with the appropriate LIS form. Proper sealing of the candle or plate is important to prevent further atmospheric reaction occurring during transit. Regional staff should take care not to touch the reactive surface of the candle or plate at any time. The duration of exposure must be recorded and submitted with the candle or plate. A complete description of sampling considerations for sulphation rate can be found in the ASTM "Gaseous Fuels; Coal and Coke; Atmospheric Analysis", Part 26, November 1980. Plates are recommended for any new surveys.

B - III NON-ROUTINE TECHNIQUES

The following techniques may be used in special circumstances after discussion with laboratory staff. The sampling of volatile organic contaminants are covered by some of these techniques.

1. LOW VOLUME SAMPLING

"Low volume" techniques include sampling with impingers, adsorption tubes, and filters. Samples for the analysis of volatile organic components such as vinyl chloride, peroxy-acetyl-nitrate (PAN), volatile aliphatic and aromatic hydrocarbons, and volatile organohalides may be collected by passing 100 to 1,000 mL of air per minute through a specially prepared tube containing activated charcoal, Chromosorb, Tenax, or another suitable adsorbent. The normal sampling period is 2 - 4 hours. The tubes are available from the Trace Organics Section. The sample, once collected, must be refrigerated and kept in the dark. The sample label attached to the tube must have the following information marked on it:

- i) Date and location
- ii) Pump time on and off
- iii) Air flow rate at the start and finish
- iv) Wind speed, direction, and temperature

Samples should be sent to the Trace Organics Section.

2. GRAB SAMPLES

An alternative way of sampling for volatile contaminants is by collecting a "grab" sample in Tedlar bags, aluminized Mylar bags, evacuated glass and metal containers, etc. A grab sample is taken by pumping air into the bag or filling an evacuated container with air. This sampling method may be applicable in cases of odour problems, specifically volatile organic and inorganic sulphurous compounds such as H_2S and mercaptans.

An important consideration is that the contaminant does not react with or adsorb on the material of the container.

3. DETECTION TUBES

By observing the length of discolouration produced in a solid absorbent of a specific tube through which a known small volume of air is drawn, the approximate concentration of a pollutant can be estimated. This method is a rapid, semiquantitative procedure for measuring high levels of gaseous pollutants (SO_2 , CO, H_2S) in the field.

4. CASCADE IMPACTORS

Impactor type samplers capable of separating particulate matter into size ranges according to their aerodynamic size are available. The cascade impactor separates particulate matter within the respirable range (0.3 - 10 μm).

The sampler may be used for differentiating between sources of pollution. For example, lead emitted from automotive sources is found in the sub micrometer fraction, while lead emitted from certain industrial operations as particles is deposited in the larger than 1 μm fractions.

The impactors are used in association with Hi-Vol samplers. A problem specific to the cascade impactor is that the jets become clogged with dirt and require frequent cleaning to maintain its calibrated flow rate.

5. DICHOTOMOUS SAMPLER

Recently a new type of air fractionating instrument, called a dichotomous sampler has come on the market. It separates the dust into two size fractions, less than 2.5 μm and 2.5 - 10 μm . The samples are collected on inert filters, which are ideal for rapid chemical analysis using X-ray fluorescence.

6. STACK SAMPLING

Stack samples can be obtained by inserting probes into a vent through which gaseous or particulate emissions pass to the atmosphere. Emission rates can be calculated from analysis of samples. Rigid procedures must be followed in stack sampling to ensure representative samples are taken. Most of this sampling is carried out by experienced outside agencies. Analytical work on stack samples has been carried out in conjunction with investigations on special industrial source emissions.

B - IV VEGETATION AND SOIL SAMPLING

1. GENERAL

The Phytotoxicology Section, Air Resources Branch (880 Bay Street), is responsible for the investigation of all complaints concerning suspected air pollution damage to vegetation or contamination of soil, and the establishment of all vegetation and soil assessment surveys in the vicinity of proposed or existing industrial emission sources. The exception is in the Northeastern and Northwestern Regions, where the work is performed by the Technical Support Sections, with assistance as required from Phytotoxicology personnel. A complete field investigation procedural manual has been prepared for use by trained personnel from these sections.

2. TYPES OF INVESTIGATIONS

a) Assessment Surveys

These surveys are conducted to document endemic conditions prior to the establishment of emission sources, to define the current state of air emissions from existing sources, and/or to monitor source compliance with Ministerial orders. Normally, a sampling grid is constructed, centred on the source and samples are taken from established stations, located at increasing distance along radii from the source to the limits of suspected contamination. Consideration is given to the location of air quality monitoring instruments and meteorological parameters such as prevailing wind direction.

b) Complaint Investigations

Samples may also be taken to evaluate situations where extensive damage to vegetation has been observed. Cases of this nature will usually be drawn to the Ministry's attention through complaints by individual citizens. All complaints of this nature should be referred to the Phytotoxicology Section. They will be investigated and reported to the Regional Manager for distribution to the individual originating the complaint and to the source of the contaminant.

3. SAMPLING PROCEDURES

To ensure a correct interpretation of analytical data, all samples that are to be compared must be carefully matched with regard to plant species, age or maturity of leaf tissues, age of tree or shrub, and position of sample on tree or shrub. Usually, foliage is collected from the side of the tree or shrub facing the presumed source of

air pollution but, occasionally, a second sample may be taken from the side opposite from the source. Samples are taken by trimming outside growth from ground level up to 6 meters or more and collecting all leaves to provide a composite sample of 500 to 1,000 grams of fresh material.

Samples are placed into perforated polyethylene bags and are transferred to refrigerated storage as soon as possible for processing in the Phytotoxicology laboratory. Forage samples (grass) are collected by cutting the terminal 25 cm of stems and blades over the representative area to be sampled. Dried flower heads and stalks are discarded and no root material whatsoever is included. The different forage species included in the sample are identified and should be representative of the population of the species in the field.

Any sample contaminated by roadside dust should be noted in the accompanying request form.

Soil samples are normally collected in conjunction with vegetation samples as an aid to differentiate between current and past emission situations. Occasionally, soil samples will be collected to establish background conditions.

Soil is collected with a 2 cm diameter stainless steel tube. A minimum of 10 cores is taken from a representative area of the sampling site. The collection form is completed to comprehensively describe the texture of the soil and the over-all sampling site. Depending on the survey emphasis, the cores may be separated into fractional depths of 0 - 5 cm, 5 - 10 cm and 10 - 15 cm. Each level is placed in an appropriately labelled plastic bag.

Ideally, soil should be sampled from an undisturbed or sodded area and contaminated situations should be as closely matched as possible with conditions existing immediately outside of the area.

4. SAMPLE STABILIZATION

All vegetation samples as collected, are potentially unstable, and will decompose unless properly handled. Care is taken to ensure that samples are not exposed to the sun and are placed in refrigerated storage until they can be processed. When dried at 80° C for 30 hours in a forced draft oven, they become almost permanently stable.

5. SAMPLE IDENTIFICATION

Collection of vegetation and soil samples is accompanied by the use of prenumbered identification stickers and the completion of special Terrestrial Effects LIS forms which will later provide all the necessary information required for interpretation of the test results. A portion of the numbered stickers is detachable and is placed in with the sample for identification. Normally, samples are "double-bagged" with the numbered stickers placed in the inner bags.

C. SAMPLE COLLECTION FOR THE ANALYSIS OF SEDIMENT, SOLID WASTES, SOIL AND BIOMATERIALS

C - I COLLECTION OF SOIL, SEDIMENT, SOLID WASTES AND BIOMATERIAL SAMPLES FOR INORGANIC CONTAMINANTS ANALYSIS

1. GENERAL

The Soils and Sediment laboratory generally carries out sample digestion or leaching on solid samples for a number of tests performed by other sections as well as performing unique sediment analyses. These are given in Table III along with the required sample size and method of preparation.

2. SAMPLING CONSIDERATIONS

- i) Where possible, composite sampling will result in a more representative sample than a single grab.
- ii) All possible sources of sample contamination should be reduced to a minimal level.
- iii) Chemical preservatives are generally not applicable to samples of this type.
- iv) Preparation of these types of samples for chemical analysis generally takes longer than for water or effluent. As a result, samples requiring immediate attention should be so marked and the laboratory should be notified well in advance. Notification of a heavy sample and/or test input is essential.
- v) Samplers should be aware of pertinent information regarding submission procedures as outlined in Section IV.

3. SAMPLE CONTAINERS

Any clean glass or plastic container is acceptable for sediment, soils or biomaterial samples. While not recommended, paper bags can be used for "dry" soil samples where contamination from the container is not anticipated to affect the analysis (e.g. particle size analysis). In general, wide mouth 60, 125, 250, 500 or 1000 mL glass or plastic containers are the most suitable, depending upon sample size. When a number of samples are submitted as a series, uniformity of sample container size is recommended for shipping, handling and storage convenience. Plastic bags (Whirl-pak type) are usually adequate for dried vegetation samples. Containers should be clearly labelled and samples numbered in sequence, preferably from No. 1. Indicate the number of containers for a sample when there is more than one.

4. PRESERVATION TECHNIQUES

Chemical preservation techniques are generally not applicable to solid type samples. In the short term, storage at 4° C or freezing will minimize the transformation of species, particularly if a soluble or "available" parameter is desired.

Drying as a preservation technique is recommended except for those samples requiring analysis of potentially volatile parameters. In practice, a portion of each sample received in the laboratory is oven dried at 110° C (not vegetation) after which most chemical tests are performed. In general, dried samples are indefinitely stable.

Air or oven drying of vegetation samples at 80° C before submission to the laboratory is recommended and where this is not possible, the laboratory must be notified so that the samples can be dried without delay. This is particularly important since the nutrient content of plant material could be significantly altered by decay.

5. SAMPLE SIZE

The field sampling personnel must be aware of the general non-homogeneity of solid samples and thus the minimum sample size should reflect this consideration. As a general rule, however, a sample which will yield 10 - 25 g of dry material will be sufficient for all the routine chemical analyses. Special analyses will require more sample depending upon the tests requested. Where it is not possible to obtain a sufficiently large sample, special arrangements can be made with the laboratory personnel to perform the analyses in a given sequence so that the more important tests will be completed first.

If leachate potential tests are required on industrial waste materials, larger sample sizes will usually be required (500 g). Do not dry before shipment.

6. SAMPLING METHODS AND FIELD RECORDS

The sampling personnel are usually in control of the sampling methodology and must be aware of how the particular details of the procedures and sampling apparatus (e.g. coring vs dredge devices) may bias the results which are eventually obtained.

C - II APIOS SOIL SAMPLING

1. OBJECTIVES

The principal objective of the baseline program is to establish a reliable and uniform data base for soils across the province. This data base serves to: 1) provide current data to identify future trends; 2) enable the development of laboratory experiments to define sensitivity criteria specific for Ontario; and 3) provide information required for mapping Ontario soils.

2. SITE SELECTION AND DESCRIPTION

APIOS baseline soil sites are located on undisturbed soils. Provincial parks, conservation areas and Crown land offering reasonable access and long-term security are generally suitable for baseline sampling.

A variety of landforms and soil types are sampled to enable the preparation of soil sensitivity maps. Variations in acidic input, climate, geology and vegetation should also be considered.

Site locations are identified by UTM coordinates and a sketch map is prepared showing the sample locations in reference to permanent local features. Sufficient detail must be included to permit future site relocation. The site should also be described according to the guidelines in the "Field Manual for Describing Soils" (Institute of Pedology, University of Guelph).

3. SAMPLING PROCEDURE

A pit of approximately 1 m² is dug to a depth sufficient to permit sampling of the parent material. Soil profiles are described according to criteria adopted by the "The Canadian System of Soil Classification" (1978). The soil pit is photographed and a sketch is drawn of one of the faces sampled to show major soil horizon boundaries and the positions of stones, root masses, and sampling points. Blank forms of the type used to record field data may be obtained from M. Griffith, Air Resources Branch (965-4516).

Beginning at the deepest horizon, duplicate samples, each approximately 1 kg, are collected with a hand trowel from opposite sides of the soil pit and placed in labelled plastic bags. When sampling is concluded, soil horizons are returned to a pit in the reverse order from which they were removed, to minimize disturbance of the sampling site.

Present plans call for a sampling frequency of approximately once every 5 years for baseline sites in Ontario. To

reduce potential effects of seasonal variations on soil properties, repeat samples should be collected at the same time of year as in the original survey.

4. SAMPLE PREPARATION AND SUBMISSION FOR ANALYSIS

To minimize physical and chemical degradation, samples should be spread out on non-metallic trays and air dried for 48 hours within a few days of collection. Dried samples are disaggregated with a porcelain mortar and pestle or motorized grinder, then sieved to two particle-size fractions: 10 mesh and 100 mesh, ASTM. From each sample, at least 150 g of the 10-mesh fraction is placed in a glass jar and submitted for analysis. Approximately 5 g of 100-mesh soil is submitted in glass vials. The remainder of the disaggregated sample is stored in cardboard or glass containers of suitable size.

The following analyses are requested for baseline samples: pH (distilled water and calcium chloride); exchangeable calcium, magnesium, potassium, and aluminum; cation exchange capacity; pyrophosphate and dithionite extractable iron, aluminum and manganese; organic carbon; total carbonates; total nitrogen; plant available phosphorus; soluble sulphur and aluminum; heavy metals (Cu, Ni, Pb, Zn); and texture (particle size). The LIS test names (in the same order as above) are: PHEW, PHECA, CAESC, MGESC, KKESC, ALESC, CEC, FEPEPY, ALEPY, MNEPY, FEEDI, ALEDI, MNEDI, COD, CCO3UR, NNTKUR, PPO4SB, SSO4EW, ALECA, CUUT, NIUT, PBUT, ZNUT, SAND, SILT, CLAY.

C - III COLLECTION OF FISH SAMPLES FOR INORGANIC AND ORGANIC CONTAMINANTS ANALYSES

1. ANALYTICAL TESTING CAPABILITIES

Fish samples, normally muscle tissue, are frequently analyzed for mercury or other metals by the Inorganic Trace Contaminants Section; pesticides, PCB's, and other organics by the Trace Organics Section, Dioxin/Furans by the Drinking Water Organics Section. The following sample procedures should be closely followed in order to obtain meaningful data as to the existence and degree of contamination.

2. SAMPLE PREPARATION AND SUBMISSION

a) Records

Details of catch, total length (cm), weight (g), sex (if possible) must be neatly recorded on the submission sheet. For proper statistical evaluation there should be a minimum of 10 fish per species. As with all samples, the required analyses should also be indicated on the submission sheet.

b) **Filleting**

Samplers are requested to submit fillets (rather than the whole fish) for analysis. Normally the analysis is carried out on tissue from the epaxial muscle (Figure 2) by making an incision with a stainless steel knife on the dorsal surface of the fish as shown (Incision No. 1). The epaxial muscle is then removed by cutting from the initial incision toward the tail (Incision No. 2) until a sufficient quantity of tissue is obtained. The muscle may be finally separated from the body by (Incision No. 3). The skin should be removed from the sample

It is important not to remove tissue from below the lateral line because of the high fat content in this region which makes PCB analysis impractical. The sample should be frozen immediately after filleting and transported to the laboratory in this condition. This is the only acceptable preservation technique. When a collection is ready for shipment to the laboratory, please phone prior to sending. For mercury or metals contact Darryl Russell at 248-3023. For PCB's or pesticides contact George Crawford at 248-3846.

c) **Sample Size**

The minimum and preferred quantities of tissue required for each type of analysis are as follows:

	Absolute minimum (g)	Preferred (g)
Mercury	20	50
Other Metals	50	100
PCB, Pesticides	10	100
Dioxin/Furans	50	500

d) **Sample Containers**

Individual samples collected only for metals and mercury analysis may be placed in small plastic bags and then frozen. Clear identification with a sample code using a masking tape label is recommended, while the use of some variety of water-proof ink is a necessity.

Samples collected for PCB or pesticide analysis must be wrapped in solvent washed aluminum foil prior to freezing. Multiple washing of the foil and knife with hexane or acetone is a necessity. Samples submitted in plastic bags for these analyses will not be accepted. When both mercury and PCB's are required, submit the sample (frozen) in solvent washed foil.

3. OTHER CONSIDERATIONS

Analysis of tissues other than muscle is possible but can only be done by special arrangements. Any further queries should be directed to Darryl Russell (248-3023), Inorganic Trace Contaminants Section, or George Crawford, (248-3846), Trace Organics.

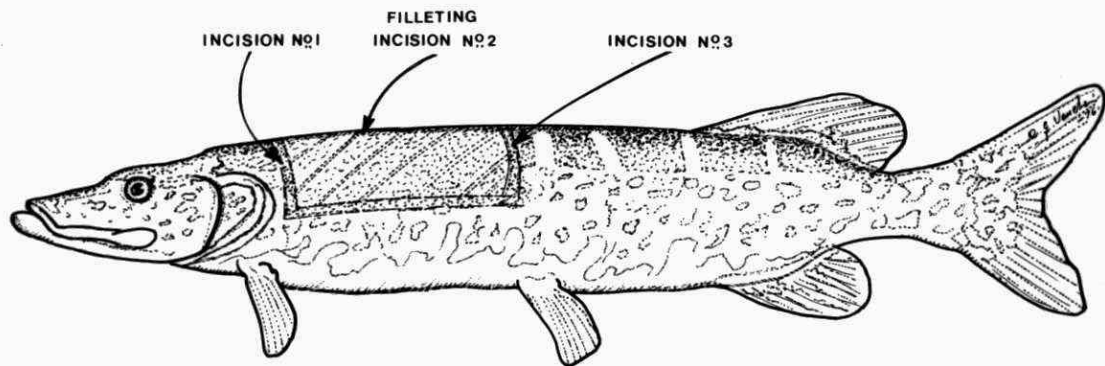


Figure 2

D. LEGAL AND COMPLAINT SAMPLING

Sampling in connection with legal action naturally requires special care due to the influence this sampling may have on case outcome. Court cases are usually initiated to determine legal responsibility for reported pollution events (stream, well contamination, vegetation or paint damage, etc.) and sampling must be conducted with this purpose in mind. In general, standard sampling methods as described previously may be used; however the following additional points and techniques should be fully read and understood before taking any legal samples.

D - I RESPONSIBILITIES

1. FIELD STAFF

- 1) Samples should be designated as "Legal" only when results may be used for prosecution or appeal proceedings.
- 2) Samples should be collected and transported to the Laboratory according to recommended procedures such as those set out in "Guide to the Collection and Submission of Samples for Laboratory Analysis" or according to specific instructions from appropriate Laboratory personnel.
- 3) Submission of Legal samples should be preceded by a phone call to the Legal Sample Co-ordinators or Alternate (248 - 3346).
- 4) All submissions should be accompanied by a full description of the problem and sampling details. Reference to previous related samples should be made if possible.
- 5) All samples must be submitted through the Laboratory Information System (LIS) with Submission and Request for Analysis forms completed and included with the samples or forwarded to the laboratory as soon as possible. The Case Submission/Receiving Report should also be filled out and enclosed with the submission forms.
- 6) Descriptions, sample locations, times, and dates given on the Request for Analysis forms must match those given on sample container labels. Any changes must be accounted for and documented by the field staff submitting the samples.
- 7) All samples listed on the Request for Analysis forms must be accounted for.

- 8) All sample containers or packing boxes must bear seals, preferably Ministry of the Environment, or locks. If paper seals are used the seal tags should be affixed to the Request for Analysis form beside the corresponding sample.
- 9) The chain of custody must be maintained and documented. If this is not documented with the submission, the sampler will be contacted to determine whether the submission is still viable for litigation. Copies of shipping way bills must be maintained.
- 10) All samples known to contain or suspected of containing hazardous materials **MUST** be labelled as such.

NOTE: Field personnel are responsible for the submission until it is received and signed for at the Laboratory by a Provincial Analyst/Officer.

NOTE: Field staff are responsible for tracking down samples lost by third party carriers. The responsibilities of laboratory staff are outlined in Appendix III.

2. FIELD AND LABORATORY STAFF

- 1) The investigating officer(s) should be in contact with the appropriate Provincial Analysts well in advance of appearing in court to discuss and clarify any interpretation of results, statements of environmental impact or recommendations which have been made in those Provincial Analysts' Certificates of Analysis or which are likely to be made in Court.
- 2) All requests for Provincial Analysts to appear in court or at meetings to discuss Legal submissions, should be made through or passed on to the Legal Sample Co-ordinators.
- 3) Field and Legal staff are responsible for detailing what materials Provincial Analysts should have available for the Court. These materials may include sample containers, raw results, log books, etc.
- 4) Provincial Analysts are responsible for having any materials specified by Field and Legal staff available for the Court.
- 5) All Provincial Analysts will have an up-to-date resume on file with the Legal Samples Co-ordinators. A listing of published papers should also be provided. A copy of each Provincial Analyst's resume will be sent to Legal Services as requested.

WATER SAMPLES FOR CHEMICAL AND MICROBIOLOGICAL ANALYSIS

The following points should be precisely adhered to when collecting court case water samples requiring chemical analyses:

- 1) The sampling area should be completely "walked", i.e. checked over at the time samples are taken, so that the sampler is completely familiar with the overall geographic "picture". The sampler must identify ALL possible contamination sources, unusual occurrences, and a "blank" sample location far enough away (upstream) that no contamination from the sources in question can influence it. The sampler should also prepare a sketch map of the area.
- 2) The sampler should be careful to obtain samples at all possible contamination sources, not just the one in question. The observed contamination should be traced back to its source, and samples collected at key points to show continuity. In the case of an underground sewer, when the defendant or official agent is unwilling to confirm continuity of flow of wastes through the sewer, in front of a witness, the sampler should verify continuity by passing some small, identifiable floating object through the sewer, and recovering it at the outfall. Similarly a series of samples downstream is advised to show how the contamination effect persists. A prerequisite is a "blank" sample unaffected by the alleged pollution (obtained upstream, or from a nearby well, etc.).
- 3) The sampler should obtain prior knowledge of exactly what type of contamination he is dealing with (i.e. what parameter(s) will be measured) and sample accordingly with respect to correct bottles, preservatives, etc.
- 4) Legal samples must be analyzed in duplicate and thus it is recommended that at least three times the normal sample volume be submitted. Any remaining sample may then be used for further confirmation or presentation in court.
- 5) It is preferable but not essential that the actual sampling be performed with the assistance of a witness who is willing to sign an affidavit and appear in court if necessary.
- 6) A complete and accurate record of sampling locations, time and date, bottle numbers, preservatives, etc., must be made. Submission sheets should accompany the samples in the normal manner. However, it is emphasized that the sample description and number on the bottle must exactly correspond to that on the sheet. If not, the certificate of analysis can be questioned, and may not be accepted as evidence.

D - III **SAMPLING FOR PARTICLE IDENTIFICATION**

In many instances, generally arising from citizens' complaints, it becomes necessary for field personnel to collect samples for constituent identification by means of microscopic, X-ray diffraction, electron probe and other techniques. The types of material normally encountered are visible solids present in air or water, that are a cause of nuisance or concern to the complainant. To facilitate the collection of these special samples, a sampling kit is available from the Laboratory Services Branch for each district office in the province. Supervisory personnel should obtain and maintain this kit, which also includes more detailed sampling instructions. General guidelines to be used for sampling are given below.

1. **AIR SAMPLES**

Dust fallout is a most frequent cause of complaints. Dust, adhering to any surface, may be removed by lifting it by means of transparent tape. While sampling with the tape, it is useful to the analyst if the damaged spots or particles are circled on the nonsticky side of the tape with a pencil or pen. Whenever tape has been used for sampling, it should be protected by means of the covering strip which comes with the tape or attached to a glass microscope slide. **UNDER NO CONDITIONS SHOULD THE TAPE BE FOLDED ON ITSELF.** When sampling suspected soot fallout (especially oil soot), the use of tape is not advisable, as the pressure used in collecting it, often destroys the identifying characteristics. In such cases it is better to remove a small paint section from outside window sills, shutters, etc. Plant leaves, eavestroughing, bird baths, furnace and air conditioner filters often act as collectors of particulate fallout. Where the fallout occurs consistently, aluminum weighing dishes, wetted with a glycerin-water mixture, can be used as miniature dustfall jars. These can be attached to a suitable vertical surface by means of a thumb tack. Samples can also be collected, using a household vacuum cleaner and a millipore field monitor, by means of a simple adapter placed between the monitor and the vacuum cleaner hose.

As a general rule, samples should not be collected from nonstationary objects such as automobiles, since the source of the dust may then be in question. Damage to automobile paint or house sidings is generally caused by very acidic or basic materials attacking the paint surface. Such types of fallout should be tested on the spot using pH indicator paper. It is often difficult to remove a representative sample from such surfaces, and on-site inspection by laboratory staff may be necessary to determine the cause of the damage.

Heavy dustfall onto snow should be sampled by scooping the snow into a large-mouth glass or plastic bottle in such a way as to maximize the amount of particulate material obtained and prevent any possible contamination from underlying soil.

All samples collected as a result of air pollution complaints should be accompanied by the analytical request and inspection report forms, which should provide all the information required to make a proper assessment of the situation.

A sketch map of the area is strongly recommended. Comparison samples of the suspected contaminants are always very useful in obtaining a positive identification of the fallout. Forward samples and forms to Rusty Moody, Inorganic Trace Contaminants Section, Resources Road, (248-3346).

2. WATER SAMPLES

Water samples that require identification of the suspended solids, may be sent to the laboratory in any of the standard containers. A few milligrams of material are usually sufficient for microscopic analysis, although for complex mixtures requiring multi-instrumental analyses, 2-3 g of material would be preferable. Submit samples to Rusty Moody, Inorganic Trace Contaminants Section (248-3346) if the material appears to be principally inorganic; if organic submit to G. Wyhovszky, Trace Organics Section (248-3469). If the material appears to be biological, submit to G. Hopkins, Aquatic Biology Unit, Aquatic Ecosystems Section (248-3058).

D - IV SAMPLING FOR GAS DAMAGE COMPLAINTS

In cases of suspected gas damage, the stained surface such as paint work, should be accompanied by an unstained sample, if available. Information as to the manufacturer and type of paint should also be obtained. Tarnishing of silverware or electrical contacts are usual indications of the presence of sulphide gases in the air. Where any type of damage due to corrosion has occurred (aluminum sidings, automobiles, wire fences), it is best to have laboratory staff inspect the damage and collect the sample for analysis. Special portable static samplers such as silver panels (for H_2S) or carbonate dishes (for common inorganic gases) may be obtained from the laboratory. Gas detection tubes (Draeger, Kitagawa) can be used for a large number of gases. These can be purchased commercially. For sampling organic vapours, the laboratory will supply specially prepared absorbent tubes or sampling bags. For gas damage to plant material, consult the Phytotoxicology Section (965-4516).

IV SAMPLE SUBMISSION

A - 1 GENERAL CONSIDERATIONS

Samplers must be aware of provincial, federal, and international regulations controlling the transport of hazardous goods (samples), and act accordingly.

When submitting samples for analysis of **organic contaminants**, be as specific as possible about the types of compounds to be determined, and also, when a specific source of contamination is suspected, send samples of the source material for comparison. In all cases, **the use of glass bottles with aluminum foil or Teflon lined caps is a necessity for organic samples.** (See Table IV for details of sample containers.)

It is difficult to sample foams. This may be best achieved by sampling just the foam with a pomade jar, then breaking the emulsion, and repeating the process until sufficient volume is obtained (usually at least 10 times). In most cases it is more useful to collect samples of the originating liquid, rather than the foam itself, for chemical analysis.

Identification of unknown contaminants is very time consuming. Samples should be as large as possible (within reason: take into account the suspected concentration of the contaminant) to allow a wide range of exploratory tests. Laboratory staff must be notified before submitting large quantities of hazardous or obnoxious wastes (i.e. mercaptans). The sampler should indicate whether qualitative or quantitative results are required. Any available information concerning the sampling point, possible contaminants, and industries implicated is extremely important for such samples. See below regarding direct communication with the analyst. Organic compounds not readily identified by the other units in the Organic Sections, may be submitted to the Mass Spectrometry or Spectroscopy units for analysis.

Samples which are not homogeneous present analytical difficulties because it is virtually impossible to take a representative aliquot. If the sampler is only interested in one phase (aqueous, solid or immiscible organic), he should label the submission form with the appropriate test code. Otherwise the laboratory will consider the whole sample, and take aliquots of the mixture.

Samples sent to the Central Laboratory, Toronto, may be analyzed by several sectional laboratories; the distribution of analyses among these sections is shown in Table I. Sample processing is much more efficient if the sampler submits separate sample containers if testing is to take place in more than one of these sectional laboratories. Your cooperation in this respect will be appreciated by everyone involved, and it will be possible to obtain the results from some laboratories earlier than others, rather than having to wait for all tests to be completed.

Many samples are perishable. Some tests (i.e. BOD5) are performed on specific days of the week. **The sampler is**

reminded that the delivery of samples to the laboratory should coincide as closely as possible with the analytical schedule. Delivery on Friday afternoons or before holidays should be avoided.

A - II SAMPLE LABELLING AND COMMUNICATION WITH THE LABORATORY

Samples must be clearly labelled and contain the following information:

- a) A sample (sender's) number. The use of a simple field numbering system is encouraged. Please use a logical numbering system (such as downstream in a river).
- b) Some other identification, normally the sample source or type (e.g. "Lake Temagami - Sharp Rock Inlet").
- c) Presence of any chemical preservative added; all others will be kept refrigerated or frozen (i.e. as received) if appropriate, until time of analysis.
- d) When appropriate, indication of a single specific analysis required for that one sample bottle; i.e. when the sample has been preserved for resins and fatty acids analysis, it should be labelled "For Resin Acids", or when submitted for preconcentration and heavy metal analysis, it should be labelled "For Preconcentration".
- e) **Samples which contain unusual or potentially dangerous substances (arsenic, cyanide, mercury, etc.) must be labelled for the protection of laboratory personnel. For example, an orange tape band around the sample container indicates that cyanide may be present. Also note any sample contents which may interfere with analyses. Many reactions which produce false analytical results can be reduced or eliminated if the analyst is forewarned.**

**BOTTLE LABELLING IS MORE IMPORTANT THAN EVER BEFORE,
SINCE IT IS OFTEN THE ONLY INFORMATION THE ANALYST SEES.**

Direct communication with the analyst (Appendix I) may be achieved in two ways:

- a) Telephone call or visit to Laboratory Services.
- b) A note accompanying samples and addressed to the analyst in charge.

In all cases a telephone call is recommended before submitting samples which need special attention. The sampler can then verify that the analysis is possible, find out who will be responsible, and when the results should be available. In addition he may arrange a mutually agreeable time to submit the samples and meet at the laboratory with the analyst, or at least determine who should receive the note describing the samples. **The note should be written on the bottom of the Submission Sheet and be marked "PLEASE NOTIFY (analyst's name) ON ARRIVAL"** Sample reception will then contact the analyst as soon as the samples are unpacked.

A - III PARAMETERS AND TEST CODES

Parameters outlined in Table 1 must be specified as LIS test codes on the Request for Analysis sheets. Most users have lists of codes appropriate to their needs. However a more detailed list will be available soon in the Guide to the LIS, in preparation. Until the booklet is available, test codes can be obtained from appropriate laboratory personnel (Appendix I).

Two points should be mentioned: spelling a test code incorrectly may result in the performance of the wrong test, and the test code does not specify which lab is to perform the test unless there is only one place where the test can be done.

Attention is drawn to the "Outlines of Analytical Methods" (1981) available from the Water Quality Section, Laboratory Services Branch, Resources Road, Rexdale, for more specific information with respect to parameter descriptions, analytical methods, sampling restrictions.

A - IV PARAMETER GROUPINGS: GROUP CODES

Although the laboratories have analytical capabilities for many parameters, certain compatible groupings are requested frequently. Such group requests are usually associated with routine monitoring programs and/or specific projects. It is the nature of the groupings to allow analysis of all the specified parameters on a single or duplicate sample bottle.

Requests for any of these groupings should be made only when ALL the parameters are required. **Otherwise, delete tests from the group by noting them in "Deletion From Group" box on Request for Analysis Sheets.** Test group codes are available for most of the common monitoring programs (see Guide to the LIS).

Unnecessary tests tax the analytical capacity of the laboratories.

Specific environmental problems usually require specific analyses to be performed and, therefore, use of these groups is of little value. Large projects and studies may find it advantageous to use a unique grouping and these may be established after consultation with the Laboratory Computer Systems Group (248-7442).

A - V

COMPLETING SUBMISSION FORMS

There are two basic documents used in submitting a sample to the laboratory for analysis, namely:

- 1) The Submission form (Figure III), which is used to enter data that is common to all samples in a submission such as sampling program, sampler's name etc., and
- 2) the Request for Analysis form (Figure IV), which is used to enter the sample information and the tests required. Data for several field samples may be entered on each sheet. If there are more samples than can be accommodated on one form, use as many sheets as required.

On the following pages, the individual fields on both forms are explained.

Provision has also been made to capture field results unique to a program. This data will be passed to the Sample Information Sytem (SIS) for storage. Field results cover such items as water temperature, sample depth, etc., and are entered on forms prepared by the specific program chiefs.



Ministry
of the
Environment

Submission

Lab. **Submission No.** From Field Sample No. To Field Sample No. Page of
Use Only

Sample Program Code				Lab	Pri	FD Type	Sampling Agency			Vote	Item	Date Submitted			
Prog.	Study	Pro. Act.	Sub. Prog. Act.				Min.	Dn.	Br.	Sec.	Unit				
Project/ Mun. Code				Municipal/Project						Name of Sampler				Phone	
Client Code 1				Report to (Name)				Phone				Establishment			
Address				City				Province (Country)				Postal Code			

----- Copies To -----

Client Code 2	Name	Phone
Establishment		
Address		
City	Province (Country)	Postal Code

Client Code 3	Name	Phone
Establishment		
Address		
City	Province (Country)	Postal Code

Client Code 4	Name	Phone
Establishment		
Address		
City	Province (Country)	Postal Code

Client Code 5	Name	Phone
Establishment		
Address		
City	Province (Country)	Postal Code

FIGURE III

A-V.1 CODING REQUIREMENTS FOR SUBMISSION DOCUMENT

The following is to be used as a guide to filling in of the Submission Document.

Lab.
use
Only

Submission No.

- The submission number is a unique number for any particular submission of samples and must not be duplicated or reused for any other submission. The submission number is usually pre-printed on the form in a sequential series for each Region or major sampling program. Alternatively, some Regions, Programs, or Branches have assigned a coded sequence of submission numbers to their users. If the submission number is not already on the form or if you are not using an assigned sequence, the submission number must remain blank, as sample reception staff will fill it in.

NOTE: THIS UNIQUE SUBMISSION NUMBER IS EXTREMELY USEFUL IN TRACKING THE ANALYSES THROUGH THE LABORATORY AND THEREFORE EVERY EFFORT SHOULD BE MADE BY THE SAMPLER TO RETAIN THIS NUMBER IN A SAFE PLACE SO THAT IT CAN BE GIVEN WHEN REQUESTING INFORMATION FROM THE LABORATORY.

From Field Sample No.

- Enter the first field sample number shown on the Request for Analysis or Field Data forms.

To Field Sample No.

- Enter the last field sample number shown on the Request for Analysis or Field Data forms.

Page of

- Enter 1 in the first box and the total number of sheets in the submission, i.e., the number of Request for Analysis pages plus one.

NOTE: The above 3 fields assist the Sample Reception staff in ensuring that all samples and sheets have arrived at the laboratory.

Sample Program Code

Prog	Study	Pro Act	Sub Prog Act
------	-------	------------	--------------------

Up to 9 digits must be entered here to define the Ministry's sampling program for which this sample was collected.

Lab

--

- A 2-character code is to be entered here to indicate which laboratory will receive the submission. Until the Regional laboratories adopt LIS, the only valid entry in this box is "TR" for the Toronto lab.

Pri

--

- Enter "N" for normal priority unless written authorization and prior laboratory consent for the use of high priority has been obtained according to Section A-VI (next). Only then can "H" for high priority be entered in this box.

FD Type

--

- Certain sampling programs require that field data be captured in LIS for subsequent transfer to SIS. If your submission is associated with such a program, enter the appropriate 2-character code, otherwise it must be left blank.

Sampling Agency

Min.	Dn.	Br	Sec.	Unit
		Reg.		

- Up to 10 characters are to be entered here to identify the organizational unit responsible for collecting and shipping the samples.

Vote Item

--	--

- Not currently used; should be left blank.

Date Submitted		
/	/	
DD	MM	YY

- Enter the numeric day, month and year on which the submission was shipped to the laboratory.

Project/
Mun. Code

- Not currently used; must be left blank.

Municipal/Project

- Up to 24 characters may be entered here to indicate the municipality or geographical area from which the samples originate.

Name of Sampler

Phone

- Enter the sampler's surname and initial (up to 20 characters in total) and telephone number.

Client Code 1

Report to (Name)

Phone

Establishment

Address

City

Province (Country)

Postal Code

- Enter the client code and name of the primary recipient of the final report or, if this person doesn't have a client code, complete all other fields.

Client Code 2	Name	Phone
Establishment		
Address		
City	Province (Country)	Postal Code

- Although the format of the areas for Client Codes 2 - 5 is different, the same information is required for each client who should receive a copy of the final report as for the primary client.



Ontario

Field Sample No.	Sample Type	Lab Sample Numbers
1		
Con. Sent	Sample Date	Time Zone 5
Sample Location/Station		Sample Description
Test Group	Deletions From Group	
		Individual Tests

Field Sample No.	Sample Type	Lab Sample Numbers
2		
Con. Sent	Sample Date	Time Zone 5
Sample Location/Station		Sample Description
Test Group	Deletions From Group	
		Individual Tests

Field Sample No.	Sample Type	Lab Sample Numbers
3		
Con. Sent	Sample Date	Time Zone 5
Sample Location/Station		Sample Description
Test Group	Deletions From Group	
		Individual Tests

Field Sample No.	Sample Type	Lab Sample Numbers
4		
Con. Sent	Sample Date	Time Zone 5
Sample Location/Station		Sample Description
Test Group	Deletions From Group	
		Individual Tests

Field Sample No.	Sample Type	Lab Sample Numbers
5		
Con. Sent	Sample Date	Time Zone 5
Sample Location/Station		Sample Description
Test Group	Deletions From Group	
		Individual Tests

Field Sample No.	Sample Type	Lab Sample Numbers
6		
Con. Sent	Sample Date	Time Zone 5
Sample Location/Station		Sample Description
Test Group	Deletions From Group	
		Individual Tests

A-V.2

CODING REQUIREMENTS FOR REQUEST FOR ANALYSIS DOCUMENT

The following is to be used as a guide to filling in of the Request for Analysis Document.

Submission No. - Transcribe the submission number from the Submission Sheet.

Page of - Enter the page number of this sheet and the total number of pages in the submission. Since the Submission sheet is page 1, the first Request for Analysis sheet is page 2.

NOTE: A field sample is defined as the entire group of samples (in suitable containers and preserved appropriately for the tests requested) taken at a given sampling point at a given time. For each field sample, the following set of data items is required.

Field Sample No. - Up to eight characters can be used to number field samples. Since this number also appears on the sample label, many users employ very simple numbering schemes. Use of a simple numbering scheme in a logical sequence will assist in the allocation of lab numbers by Sample Reception Staff.

Sample Type - For some sampling programs, specific instructions have been given for field staff to enter the appropriate code.

However, in most cases, this area is filled in by Sample Reception staff. Unless you have received instructions to the contrary, leave this area blank.

Con. Sent - Enter the total number of containers (suitable bottles, preserved appropriately) for this field sample.

Sample Date	Time	Zone
.	.	5

- Enter the date (in DD/MM/YY format) and, if appropriate for data interpretation, the time (24 hour clock) that the sample was taken. Time zone 5 (Eastern) is appropriate for the majority of the province. The western portion should use zone 6 (Central).

Sample Location/Station

- Enter the appropriate structured code, depending on the sampling program.

Sample Location Description

- Included on the newer Request for Analysis forms is this field of up to 40 characters for an optional alphanumeric description of the sample location code.

Sample Description

- Up to 32 characters can be used here to describe relevant features of the sample. Since some clients have found this space inadequate, we have added the facility for entering 3 additional lines of 40 characters each. Users desiring this capability should avail themselves of the appropriate special forms from LIS staff (248-7442).

Test Group	Deletions From Group	Individual Tests

- These three columns are used jointly to specify the complete set of tests for all containers of this field sample.

NOTE: Tests have been given codes (up to 6 characters each) and many combinations of tests have been grouped to simplify the work of field staff as well as data entry personnel. The valid codes for tests and test groups are available from the Regional/Branch Liaison Group (Table V) or from Laboratory staff. The total testing requirements of the field sample are specified by selection of the appropriate combination of test groups and individual tests.

Enter test group codes only in the left-hand column. If some of the tests included in the groups you have selected are not required, enter their individual test codes in the centre column. If individual tests are required, specify their codes in the right-hand column.

Additional information, in particular messages to analysts, should be written in the blank area at the bottom of the Submission sheet. It will be photocopied and passed on to the appropriate Laboratory staff.

TABLE V

LIS/SIS REGIONAL/BRANCH LIAISON GROUP

Air Resources Branch	Bob Chai	(416) 965-4516
Water Resources Branch	Ken Rego	(416) 965-6141
Central Region	Dhan Sharma	(416) 424-3000
West Central Region	Stan Irwin	(416) 521-7640 Hamilton
Southeastern Region	Dave Dillenbeck	(613) 549-4000 Kingston
Southwestern Region	Walter Cook	(519) 681-3600 London
Northeastern Region	Gerry Myzlik	(705) 675-4501 Sudbury
Northwestern Region	Len Maki	(705) 475-1205 Thunder Bay

A-VI HIGH PRIORITY SUBMISSION PROTOCOL

Samples are designated as "EMERGENCY" when collected as the result of a contingency which poses a direct threat to human health or which may lead to an emergency environmental situation.

Samples must be collected according to recommended laboratory procedures.

Each MOE Region and Branch must designate a senior staff member and alternate person who will co-ordinate high priority submissions for their specific area.

High priority submissions must be authorized by this senior staff member and receipt of high priority samples must be preceded by a phone call to either the central laboratory emergency response co-ordinator or to any appropriate section Emergency Response Task Force (ERTF) representative or Manager (Table VQ).

The laboratory personnel contacted will obtain a full description of the problem and sampling details and will ensure that the samples are received when and as described. The contact person is also responsible for ensuring that sample reception staff are notified and that the submission is assigned an "H" priority, and for contacting ERTF representatives in each affected laboratory section. An estimated completion date will be established and transmitted to the client.

All samples must be submitted through LIS with Submission and Request for Analysis forms completed and included with the samples if possible, or forwarded as soon as possible. A signed authorization form from the senior regional co-ordinator must also accompany samples or be forwarded as soon as possible. Forms with photocopied signatures are not acceptable.

Submissions not meeting these requirements will be designated as Normal (N) priority and treated as such.

If arrangements have been made with ERTF personnel, results will be phoned-in to the client immediately upon completion of specific analyses prior to printing of a final LIS report.

THE ERTF will meet every 2 to 3 weeks to review the status of all high priority submissions and to expedite completion of analyses within the estimated time limit.

If the laboratory cannot complete the analysis within the defined time limit, the ERTF representative of the section responsible for the delay must contact the client to explain the problem and assume responsibility for ensuring completion of the work by a mutually agreeable date.

**TABLE VI
EMERGENCY RESPONSE TASK FORCE (ERTF)
LABORATORY SERVICES BRANCH**

(all area codes are 416)

		<u>Business</u>	<u>Home</u>
Central Co-ordinator	Frank Tomassini	248-3512	857-1571

ERTF REPRESENTATIVES

Water Quality	Vera Turner	248-3512	833-5969
Inorganic Trace Contaminants	Liz Pastorek	248-3346	244-1023
Trace Organics	Joe Osborne	248-3846	273-6579
Drinking Water Organics	David Hall	248-3939	791-2302
	Vince Taguchi	248-3755	848-8023

SECTION MANAGERS

Water Quality	Larry Vlassoff	248-3512	924-0926
Inorganic Trace Contaminants	Barry Loescher	248-3346	927-0802
Trace Organics	Gerry Rees	248-3846	491-7279
Drinking Water Organics	Helle Tosine	248-7486	766-7409
Senior Environmental Scientist (Organics)	Otto Merez	248-3031	445-7081

LAB PAGING SYSTEM - (for emergency use only) 248-7134

A - VII SAMPLE CONTAINER REQUISITION AND SHIPPING PROCEDURES

Sample containers may be requisitioned according to need using the information provided in Table IV.

Certain projects or studies may require the use of special container types, and appropriate enquiry should be made prior to requisition.

Courier services provide the fastest and most reliable service for the shipment of environmental water samples in Ontario. Air express, parcel post, bus companies and other services discourage the shipment of water samples because of the damage caused to other shipments when breakage occurs.

Samplers must be aware of provincial, federal, and international regulations controlling the transport of hazardous goods (samples), and act accordingly.

NOTE:

Contract numbers are important as they provide the only means for tracing a lost shipment. Every shipment is assigned a contract number, but it is generally up to the sampler to attach this contract number to each carton of his shipment. Identification stickers are provided by the courier companies upon request. Samplers are urged to keep a record of all their contract numbers.

TABLE I
ANALYTICAL TESTING CAPABILITIES - LABORATORY SERVICES BRANCH

Please consult Tables, II, III, and IV for Sampling Requirements

CODE - D - Drinking Water Organics Section (DWO)
 W - Water Quality Section (WQS)
 I - Inorganic Trace Contaminants Section (ITC)
 P - Trace Organics Section (TO)

L - London Regional Laboratory
 T - Thunder Bay Regional Laboratory
 K - Kingston Regional Laboratory

MAJOR IONS	W	I	L	T	K
Alkalinity	X		X	X	X
Calcium	X	X	X	X	X
Chloride	X	X	X	X	X
Conductivity	X		X	X	X
Hardness	X		X	X	X
Magnesium	X	X	X	X	X
Potassium	X	X	X	X	X
Silicates - Reactive	X		X	X	
Sodium	X	X	X	X	X
Sulphate	X	X	X	X	X

NUTRIENTS	W	I	P	L	T	K
Ammonia Nitrogen (Filtered)	X	X		X	X	X
Nitrate Nitrogen	X	X		X	X	X
Nitrite Nitrogen	X			X	X	X
Nitrogen - Total Kjeldahl	X			X	X	X
Phosphorus - Total	X			X	X	X
Phosphorus - Filtered Reactive	X			X	X	X
Phosphorus - P32		X				

METALS	W	I	L	T	K
Aluminum	X			X	
Antimony	X				
Arsenic	X			X	
Barium	X				
Beryllium	X				
Bismuth	X				
Boron	X				
Cadmium	X			X	
Chromium - Hexavalent	X				
Chromium	X			X	
Cobalt	X			X	
Copper	X			X	
Iron	X		X	X	X
Lead	X			X	
Lithium	X				
Manganese	X			X	
Mercury	X			X	
Molybdenum	X				
Nickel	X			X	
Selenium	X				
Silver	X				
Strontium	X				
Tellurium	X				
Thallium	X				
Titanium	X				
Uranium	X				
Vanadium	X				
Zinc	X			X	

TABLE I (Cont'd) - ANALYTICAL TESTING CAPABILITIES

Please consult Table II for Sampling Requirements

ORGANIC	W	I	P	L	T	K	D	OTHER	W	I	P	L	T	K
Base Neutrals/Acid Extractables			X				X	Acidity	X			X	X	X
								Algae *						
								Asbestos	X					
Benzene Soluble Organics			X					Carbonate (Hivol)	X					
Biochemical Oxygen Demand (BOD5)	X			X	X	X		Chlorine (Free, Resid., Mono/dichloramine)	X					
Carbon - Free (Elemental; Hivol)		X						Chlorine - Total (X-ray)	X					
Carbon Dioxide	X							Chlorophyll	X				X	
Carbon - Dissolved Inorganic	X							Colour - True	X			X	X	X
Carbon - Dissolved Organic	X							Colour Dilution	X					
Carbon - Inorganic	X			X				Corrosivity (Industrial Waste)	X					
Carbon - Total (Hivol)	X	X		X				Cyanide	X					
Carbon - C ¹⁴		X						Dustfall	X			X	X	
Chemical Oxygen Demand (COD)	X			X	X	X		Fluoridation Rate	X					
Dioxin							X	Flashpoint (Indust. Waste)	X					
Foams *			X					Fluoridation Rate	X					
Hydrocarbon Gases			X					Fluoride	X	X		X	X	X
Mass Spectrometric Services							X	Hydrogen (Indust. Waste, Soil)	X					
Mercaptans - see Volatile			X					Leach test (Indust. Waste)	X					
Sulfurous Organics								Loss on Ignition	X				X	X
Methane - see Hydrocarbon gases			X					Nitrogen (Indust. Waste, Soil)	X					
Methylene Blue Active Substances	X			X				Oxygen - Dissolved	X			X	X	X
Petroleum Hydrocarbons (Gasoline)			X					Particle Size Analysis (Laser beam)	X					
Phenolics - Reactive	X			X	X			Particle Size by Microscopy (EM Unit)	X					
Polybrominated Biphenyls			X					Particulate Identification (Complaint)*	X					
Polychlorinated Biphenyls			X				X	pH	X	X		X	X	X
Polynuclear Aromatic Hydrocarbons		X					X	Phytoplankton*						
Purgeables			X				X	Reactivity (Indust. Waste)	X					
Resin and Fatty Acids			X					Settleability	X					
Solvent Extractables			X					Sieve Analysis	X					
Tannins and Lignins			X					Silicon	X					
Tracer Dyes			X					Sludge Volume Index	X					
Trihalomethanes			X				X	Solids - Dissolved	X			X	X	X
Vinyl Chloride			X					Solids - Ignited	X			X	X	X
Volatile Sulfurous Organics			X					Solids - Suspended (by filtration)	X			X	X	X
								Solids - Total	X			X	X	X
								Sulfation Rate					X	
								Sulfide	X	X		X		
								Sulfite	X					
								Sulfur - Total	X					
								Sulfur - Trace by S ³⁵ dilution	X					
								Suspended Air Particulates - Total	X				X	
								Thiocyanate	X					
								Turbidity	X			X	X	X
*Aquatic Biology Unit: Algal taxonomy, and examinations of phytoplankton, periphyton, zooplankton, slime, scum, foams, and biological nuisance organisms are performed at the Central Laboratory by the Aquatic Biology Unit, Water Resources Branch.														

*Aquatic Biology Unit: Algal taxonomy, and examinations of phytoplankton, periphyton, zooplankton, slime, scum, foams, and biological nuisance organisms are performed at the Central Laboratory by the Aquatic Biology Unit, Water Resources Branch.

TABLE I (Cont'd) - ANALYTICAL TESTING CAPABILITIES

Please consult Table II & Table III for Sampling Requirements

PESTICIDES

All pesticide analyses are conducted at the Central Laboratory, Toronto. Effluents, landfill leachates, fish, other biota, soils, sediments, and observation wells are analyzed by Trace Organics Section; drinking, ground and surface water (not associated with sewage or industrial effluents) are analyzed by Drinking Water Organics Section.

Carbamate Insecticides/Herbicides
Chlorinated Aromatics
Chlorophenoxy Acid Herbicides
Organochlorine Pesticides
Organophosphorus Insecticides
Phenyl Urea Herbicides
Triazine Herbicides

SEDIMENTS AND SOILS

I

Chemical

Chemical Oxygen Demand	X
Extractable Metals - DTPA	X
Hot Acid Extraction	X
Leachate	X
Mild Extraction	X
Sequential Extraction	X
Total Metals	X

Physical

Cation Exchange Capacity	X
Loss on Ignition	X
Moisture Content	X
Particle Size Distribution	X
Permeability	X
Plasticity	X

MICROBIOLOGY

C L T K

C = Central Laboratory, Toronto
L = London Laboratory,
T = Thunder Bay Laboratory,
K = Kingston Laboratory

Fecal Pollution Indicators

Coliforms - Total	X	X	X	X
Coliforms - Fecal	X	X	X	X
Enterococci	X	X	X	X
<u>Escherichia coli</u>	X	X	X	X
<u>Fecal Streptococci</u>	X	X	X	X
Presence Absence Procedure	X	X	X	X
<u>Pseudomonas aeruginosa</u>	X	X	X	X
<u>Salmonella sp.</u>	X	X	X	X

Industrial/Agricultural Pollution Indicators

<u>Klebsiella sp.</u>	X	X	X	X
Nitrogen cycle bacteria				
- Denitrifying bacteria	X	X	X	
- <u>Nitrobacter sp.</u>	X	X	X	
- <u>Nitrosomonas sp.</u>	X	X	X	
Phenol Degraders	X	X	X	
Sulfate Reducers	X	X	X	X
Sulfur Oxidizers	X	X	X	

Nuisance Organisms

X X X X

Organic Enrichment Indicators

Fungi	X	X		
Heterotrophic bacteria				
- Surface Water	X	X	X	X
- Treated Water	X	X	X	X

Taxonomy

X X X X

TABLE II - SPECIFIC PARAMETER INFORMATION

A number of the determinations listed in Table II may be applied to several sample matrices. The information in the table is for aqueous samples unless otherwise stated. Other eligible matrices are indicated by initial in parentheses in the comments column, and sampling information is available from the appropriate laboratory section. Ambient air samples are collected in aluminized plastic bags, 5 to 22 L.

H = Hi-Vol filters; V = Vegetation; S = Sediments & Soils; A = Ambient Air; B = Biomaterials, Fish; D = Dustfall; P = Aquatic Plants

Parameter	Container	Preservation Technique	Minimum Volume Required	Comment or Common Name
MAJOR IONS				
Alkalinity	Glass or Plastic	None	75 mL	Specific Conductance
Calcium	" "	"	75 mL	
Chloride	" "	"	50 mL	
Conductivity	" "	"	75 mL	
Hardness	" "	"	75 mL	
Magnesium	" "	"	75 mL	
Potassium	" "	"	40 mL	
Silicates - Reactive	Plastic only	"	50 mL	Silica
Sodium	Glass or Plastic	"	40 mL	
Sulphate	" "	"	50 mL	
NUTRIENTS				
Ammonia Nitrogen (Filtered)	Glass or Plastic	Freeze or	75 mL	Free Ammonia
Nitrate Nitrogen	(not linear polyethylene)	Refrigerate	"	
Nitrite Nitrogen	"	"	"	
Nitrogen - Total Kjeldahl	"	"	"	
Phosphorus - Total	"	"	"	
Phosphorus - Filtered Reactive	"	"	"	Soluble Phosphorus, Orthophosphate
Phosphorus - Filtered Total	Screw-cap culture	Filter in field	35 mL	Container available from Water Quality Section
Phosphorus - p32	Consult with staff of the Inorganic Trace Contaminants (ITC) Section during the design phase of the sampling or research program.			

TABLE II - SPECIFIC PARAMETER INFORMATION (Cont'd)

Parameter	Container	Preservation Technique	Minimum Volume Required	Comment or Common Name
METALS				
Aluminum	Plastic or Glass(2)	HNO ₃ to pH of 2	100 mL; 900 mL required	(H, V, S, D, B)(4)
Antimony	"	(approximately 20 drops	for pre-concentration	
Barium	"	per liter)(1)	ultra-trace analysis)	
Beryllium	"	"	"	"
Cadmium	"	"	"	"
Chromium	"	"	"	"
Cobalt	"	"	"	"
Copper	"	"	"	"
Iron	"	"	"	"
Lead	"	"	"	"
Lithium	"	"	"	"
Manganese	"	"	"	"
Molybdenum	"	"	"	"
Nickel	"	"	"	"
Silver	"	"	"	"
Strontium	"	"	"	"
Tellurium	"	"	"	"
Thallium	"	"	"	"
Titanium	"	"	"	"
Uranium	"	"	"	"
Vanadium	"	"	"	"
Zinc	"	"	"	"
Arsenic	"	None	50 mL	(V, S, D, B)
Boron	Plastic only	HNO ₃ as above	100 mL	(V, S, D, B)
Chromium - hexavalent	Glass only	None	100 mL	(V, S, D)
Mercury	Glass only	HNO ₃ + K ₂ Cr ₂ O ₇ (3)	200 mL	(V, S, B)
Selenium	Plastic or Glass ²	HNO ₃ as above	100 mL	(H, V, S, D, B)

- 1 Nitric acid preservative should be added AFTER the sample is placed in the bottle. If the sample contains visible suspended solids or where a hazardous chemical reaction between the sample and the acid may occur, submit the sample unpreserved.
- 2 Acid washed polyethylene or new (unwashed) polystyrene containers are required for ultra-trace analysis; glass bottles must have non-metallic cap liners.
- 3 A special milk dilution bottle (stores #8c) is used for Hg samples. Add 1-2 mL HNO₃ per 250 mL, followed by at least 10 drops of K₂Cr₂O₇. The K₂Cr₂O₇ solution should produce a definite yellow colour. Omit preservation where dangerous reactions may occur, or where the sample is heavily contaminated with organic material. If in doubt contact Darryl Russell (248-3023).
- 4 Most of the metals listed can be determined also on Hi-Vol filters (H), vegetation (V), sediment/soils (S), and dustfall (D); some of the metals listed can be determined on biomaterials (B). For specific metals, contact appropriate I.T.C. staff (Appendix I).

TABLE II - SPECIFIC PARAMETER INFORMATION (Cont'd)

Parameter	Container	Preservation Technique	Minimum Volume Required	Comment or Common Name
ORGANIC				
Acid extractables	Glass (6)	Refrigerate	1 L	(7)
Base/neutral extractables	Glass (6)	Refrigerate	1 L	(7)
Benzene Soluble Organics				(D, H, S, B, A)
Biochemical Oxygen Demand	Glass	Refrigerate	500 mL	BOD ₅ - Please Mark Lid With Green Tape
Carbon - Free (Elemental)				(H, S)
Carbon Dioxide	Special (5)	Refrigerate	-	Free CO ₂
Carbon - Dissolved Inorganic	Glass or Plastic	"	50 mL	
Carbon - Dissolved Organic	Glass or Plastic	"	"	
Carbon - Inorganic	Glass or Plastic	"	"	(H, S)
Carbon - Total	Glass or Plastic	"	"	(H, S)
Carbon - C ¹⁴	- Consult with ITC Staff			
Chemical Oxygen Demand	Glass	Refrigerate	25 mL	C.O.D.
Dioxin	-Consult with Drinking Water Organics (DWO) Section			
Foams		Glass	Refrigerate	-Consult Trace Organics (TO) Section
Freons		Glass	Consult with TO Section	
G.C./M.S. Characterization	Brown Glass, foil liner (6)	Refrigerate	2 L	Consult Mass Spectrometry Unit
Hexachlorobenzene (OWOC Scan)	Glass (6)	Refrigerate	(6)	HCB
Hydrocarbon Gases	Glass	Refrigerate	1 L	(A)
Mercaptans - see Volatile Sulfurous Organics				
Methane - see Hydrocarbon gases				

TABLE II - SPECIFIC PARAMETER INFORMATION (Cont'd)

Parameter	Container	Preservation Technique	Minimum Volume Required	Comment or Common Name
ORGANIC				
Petroleum Hydrocarbons(Gasoline)	Glass	"	1 L	
Phenolics - Reactive	Glass	CuSO ₄ - H ₃ PO ₄	250 mL	A special bottle containing preservative is available.
Polybrominated Biphenyls	Glass (6)	Refrigerate	(6)	PBB
Polychlorinated Biphenyls	Glass (6)	Refrigerate	(6)	PCB (for drinking, surface and ground water, use (OWOC) scan)
Polynuclear Aromatic Hydrocarbons	Glass	"	1 L	PAH
Purgeable Organics	Glass	"	250 mL	<u>No</u> preservatives
Resins and Fatty Acids	Glass	Adjust to pH 3 with HCl; refrigerate	1 L	
Solvent Extractables	Glass	Refrigerate	1 L	Ether Solubles
Tannins and Lignins	Glass	"	200 mL	
Tracer Dyes	Consult with Trace Organics Section			
Trihalomethanes	Glass	"	250 mL	<u>No</u> preservatives
Vinyl Chloride	Glass	Refrigerate	1 L	(A)
Volatile Acids	Glass	"	25 mL	(Combined, for sewage sludges)
Volatile Sulfurous Organics	Glass	"	1 L	(A)

- CO₂ samples are to be carefully transferred from the sampling device into the bottom of a leak-proof glass stoppered container so as to prevent splashing. After copious overflow the bottle must be stoppered excluding air and rushed to a laboratory.
- Special solvent washed and baked containers are supplied. Fill container to mark, approx. 900 mL.
- The same sample may be used for both acid and base neutral extractables.

TABLE II - SPECIFIC PARAMETER INFORMATION (Cont'd)

Parameter	Container	Preservation Technique	Minimum Volume Required	Comment or Common Name
OTHER				
Acidity	Glass or Plastic	Refrigerate	50 mL	Precip. or surface water samples
Asbestos	Plastic	Refrigerate Analyze within 48 hours.	1 L	(H, special filter)
Chlorine - Total Residual,	Glass	(9)	500 mL	(H, V)
Free Available, Monochloramine,	"	(9)	500 mL	
Dichloramine	"	(9)	500 mL	
Chlorophyll	Field filtration preferred	(8)	500 mL	
Colour - Apparent	Glass or Plastic	Refrigerate	75 mL	Hazen Colour Units
Colour Dilution	Glass or Plastic	Refrigerate	50 mL	
Cyanide	Glass or Plastic	NaOH to pH 11+	500 mL	
Dustfall	See text			
Fluoridation Rate	See text			
Fluoride	Glass or Plastic	Refrigerate	50 mL	(H, V, B by ISE (11))
Loss on Ignition	Glass or Plastic	Refrigerate	500 mL	(D, H, S, V);
Oxygen - Dissolved	Glass	(9)	600 mL	Use BOD bottles
Particle Size Analysis	Sediment samples only; Contact ITC			
Particle Size by Microscopy	Non-aqueous samples only; Contact EM Unit			
Particulate Identification (Complaint Samples)	D,V,P; ITC, or Aquatic Biology Unit, Water Resources Branch.			

- (8) In the field, filter up to 1000 mL sample (minimum volume required 500 mL) through one nylon membrane filter (1.2 µm pore size, 47 mm dia: Central Stores Cat. No. F036-1). Fold the filter in half avoiding exposure of the suspended matter, and place it on a filter pad (Cat. No. F066-1) in a plastic Petri dish equipped with a cover (Cat. No. D069-1). Record the volume (to the nearest 10 mL) of sample, which is filtered, on the Petri dish. If field filtration is not feasible, submit one litre of sample in a glass container. **For either dishes or bottles, protect samples from the light, refrigerate, and ship as soon as possible.**

NOTE: For chlorophyll analyses, the laboratory welcomes two filters or two bottles of sample. These replicates are needed to obtain duplicate data for our quality control program.

TABLE II - SPECIFIC PARAMETER INFORMATION (Cont'd)

Parameter	Container	Preservation Technique	Minimum Volume Required	Comment or Common Name
OTHER				
pH	Glass or Plastic	Refrigerate	50 mL	
Settleability	Glass	"	900 mL	
Sieve Analysis	-	-	-	Non-aqueous samples only
Silicon	-	-	-	"
Sludge Volume Index	-	-	-	Calculated parameter
Solids - Filtered	Glass	Refrigerate	75 mL	
Solids - Ignited	"	"	600 mL	See also Loss on Ignition
Solids - Suspended	"	"	"	
Solids - Total	"	"	75 mL	
Sulfation Rate	-	-	-	See text - Section III.B.II.5
Sulfide	Glass or Plastic	Zn acetate + Na ₂ CO ₃ (10)	900 mL	Consult Inorganic Trace Contaminants Section prior to sampling
Sulfite	"	Refrigerate	1 L	
Sulfur - Total	-	-	-	Non-aqueous samples only
Sulfur - Trace by S ³⁵ dilution	-	-	-	Consult with Radiotracer Unit
Suspended Air Particulates - Total	-	-	-	TSP
Thiocyanate	Glass or Plastic	NaOH to pH 11+	"	
Turbidity	"	Keep in darkness	50 mL	

(9) Due to the perishable nature of the measured constituents, analysis should ideally be performed on-site. For lab analysis, after proper sampling and refrigeration, samples must be submitted within 4 hours of collection with prior laboratory notification.

(10) 2 mL of 2N Zinc Acetate followed by dropwise addition of 5% Sodium Carbonate solution until precipitation complete.

(11) ISE = Ion Selective Electrode

TABLE II - SPECIFIC PARAMETER INFORMATION (Cont'd)

Parameter	Container	Preservation Technique	Minimum Volume Required	Comment
PESTICIDES				
Carbamate Insecticides/Herbicides	Brown glass (1 L)	Refrigerate	Fill container to mark, approx. 900 mL	Scan
Chlorinated Aromatics (12)	A special solvent rinsed container is required and is available through Central Stores.	"	"	Scan
Chlorophenoxy Acid Herbicides (13)		"	"	Scan
Chlorophenols (13)		"	"	Scan
Organochlorine Pesticides		"	"	Scan
Organophosphorus Insecticides		"	"	Scan
Phenyl Urea Herbicides (12)				Scan
Triazine Herbicides		"	"	Scan

(12) Available on a low volume, by special arrangement only.

The Trace Organics Section will, by special arrangement, undertake a low volume of custom miscellaneous pesticide analyses where the above listed classes are inappropriate to the data user's needs. The section is also developing methods to cover a wide range of industrially produced organic contaminants, and invites inquiries from interested samplers.

(13) Special pack #3; PCB bottles with Teflon liners in caps are required.

TABLE II - SPECIFIC PARAMETER INFORMATION (Cont'd)

Parameter	Preferred Sampling Container	Preservation Technique	Minimum Volume of Sample (mL)	Analytical Technique
MICROBIOLOGY				
Fecal Pollution Indicators				
Routine				
Coliforms - Total	Presterilized glass bottles containing sodium thiosulphate	Refrigeration;	200	Membrane Filtration Incubation on Selective Agar
- Fecal	"	"	"	"
Fecal Streptococci	"	"	"	"
Presence Absence Procedure	"	"	"	"
<u>Pseudomonas aeruginosa</u>	"	"	"	"
Non-routine				
<u>Enterococci</u>	"	"	"	"
* <u>Escherichia coli</u>	"	"	"	"
* <u>Salmonella</u> sp.	"	"	500 - 1000	Membrane Filtration or Moore Swabs - Incubation In Selective Broth
Organic Enrichment Indicators				
*Fungi	"	"	150	Membrane Filtration Incubation on Selective Agar
Heterotrophic Bacteria				
- Surface Water	"	"	"	Spot or Spread Plate Incubation on Non-Selective Agar
- Treated Water	"	"	"	Membrane Filtration Incubation on Non-Selective Agar
Nuisance Organisms				
Taxonomy	"	"	"	Membrane Filtration Direct Microscopy or MPN Incubation in Selective Broth Direct Microscopy and Biochemical Testing

* Only by special arrangement with the appropriate laboratory.

TABLE II - SPECIFIC PARAMETER INFORMATION (Cont'd)

Parameter	Preferred Sampling Container	Preservation Technique	Minimum Volume of Sample (mL)	Analytical Technique
MICROBIOLOGY				
Specific (Industrial/Agricultural) Pollution Indicators				
* <u>Klebsiella</u> sp.	Presterilized glass bottles containing sodium thiosulphate	Refrigeration: for chlorinated samples (see text)	200	Membrane Filtration Incubation on Selective Agar
*Phenol degrading bacteria	"	"	"	MPN Incubation in Selective Broth
*Nitrogen Cycle Bacteria				
- <u>Nitrosomonas</u> sp.	"	"	"	"
- <u>Nitrobacter</u> sp.	"	"	"	"
- Denitrifying Bacteria	"	"	"	"
*Sulphate Reducers	"	Refrigeration only	"	"
*Sulphur Oxidizers	"	"	"	"
Specialized Capabilities				

Techniques for collection, handling and analysis of samples will be determined by project needs and must be decided by consultation with the Microbiology Units. Methods are available to determine microbial biomass, metabolic activity transformation reactions, and to identify unknown bacterial isolates.

* Only by prior arrangement with the appropriate laboratory.

TABLE II - SPECIFIC PARAMETER INFORMATION (Cont'd)

Type of Test	Container	Preservation Technique	Minimum Volume Required	Comment
AQUATIC BIOLOGY *				
Phytoplankton Biomass (Quantitative)	1 L Glass	Lugol's Iodine Solution - 2 mL/L	1 L	use special plastic lined caps - Pack #3's
Phytoplankton Biomass (Qualitative - Identification)	1 L Glass	Lugol's Iodine Solution and/or Refrigerate - 2 mL/L	1 L	preserved and/or live samples
Algae Identifications algal mass and/or slime accumulations	wide mouth container	Lugol's solution, Formaldehyde and/or refrigerate - 2 mL/L	100 mL	Biological material should only be 1/10 of container volume topped with water
Nuisance Organisms algae, zooplankton, aquatic weeds, pine pollen, shoreline accumulations	wide mouth container	Lugol's solution, Formaldehyde and/or refrigerate - 2 mL/L	100 mL	Biological material should only be 1/10 of container volume topped with water

* Water Resource Branch

TABLE III
TESTS PERFORMED BY THE SEDIMENT & SOILS LABORATORY

Type of Test	Sample Size - Grams		Extracting Reagent	Parameters	Notes
	Minimum	Optimum			
CHEMICAL					
Hot Acid Extraction (Routine)	0.2	2 +	HCl/HNO ₃ H ₂ SO ₄ /HNO ₃ HCl/HNO ₃ H ₂ SO ₄ /persulphate HCl (after ashing)	Most metals Silver, titanium Most metals Total nitrogen & phosphorus Potassium, sodium	Determined by AAS and ICAP Ashed vegetation
Total Metals (Non-Routine)	1	5 +	HNO ₃ /HClO ₄ /HF/H ₂ O ₂	Most metals (Not silica)	Also determinations by powder spectrograph, including silica
Chemical Oxygen Demand	0.2	1	H ₂ SO ₄ /K ₂ Cr ₂ O ₇		
Extractable Metals	5		DTPA	Some toxic metals (except lead)	Tentative
Mild Extraction Conditions (Non-routine)			Ammonium acetate Acetic acid Sulphuric acid Hydrochloric acid Water - cold Water - hot Copper chloride Calcium chloride Sodium bicarbonate	Some toxic metals Some toxic metals Metals, phosphorus Metals Anions, Metals & Nutrients Conductivity, pH Boron Aluminum pH Phosphorus	Sediments Tentative Preferred method Measure of "available" P
Sequential Extraction (Non-routine)	5	20 +	Citrate-dithionite-bicarbonate NaOH HCl	Apatite and non-apatite phosphorus	Measure of "available" P
Leachate (Non-routine)	10	100 +	Water Dilute acid Organic	All All All	Column and "shake" leach tests Usually "shake" tests Usually "shake" tests

TABLE III (Cont'd)

TESTS PERFORMED BY THE SEDIMENT & SOILS LABORATORY

Type of Test	Sample Size - Grams	
	Minimum	Optimum

PHYSICAL		
Partical Size Distribution	5	10
Plasticity	50	
Permeability	200	
Loss on Ignition	2	5
Moisture Content	5	10
Cation Exchange Capacity	10	50

Note: For Non-routine tests it is usually advisable to consult with Sediment & Soil Laboratory staff (248-3346).

TABLE IV
SAMPLING SUPPLIES - CENTRAL STORES

CHEMICAL SAMPLING CONTAINERS

***Restricted Use**

WM = Wide Mouth

Type of sample or	Container	Pack contents	Pack No.	Special Features analysis
Water, liquid wastes - general purpose	1 L Glass	6 bottles (3 x 2)	Pack #3	foil liner in cap
Water; Public Health domestic inspections	200 mL Plastic	10 bottles in sleeves	Health Pack	Includes sleeves, mailing labels, submission form
Sludges, sediments -general purpose including metals	1 L WM Glass 500 mL WM Glass	6 jars (3 x 2) 12 jars (3 x 4)	Pack #4 Pack #5	
Low level nutrients	250 mL WM Polystyrene	12 jars (3 x 4)	Pack #12	freezable
PCB, pesticides, organics	1 L Brown Glass 500 mL WM Glass	6 bottles (3 x 2) 12 jars (3 x 4)	Pack #3P Pack #5P	foil liner, container washed with solvents
PCB's in oil	30 mL glass	24 jars	Pack #21	
Phenols	250 mL Glass Green Label	2 bottles 4 bottles	Pack #6P Pack #7P	white rubber liner, preservative added
General chemical tests	250 mL glass	4 bottles 48 bottles	Pack #7TC Pack #8TC	black label, unsterilized recycled
Chlorophenols/ phenoxy acids	1 L Brown Glass	6 bottles (3 x 2)	Special #3	solvent rinsed, baked;
Purgeables & Trihalomethanes	250 ml Glass	4 bottles	Pack 7TC	Teflon lined cap black label, foil lined cap; NO PRESERVATIVE!
Metals, precipitation and low level nutrients	500 mL WM Polystyrene	12 jars (4 x 3)	Pack #20	use once only
(Metal analysis - general	1 L Glass	6 bottles (3 x 2)	Pack #3s	pulp liner in cap standard - foil is unsuitable
	1 L WM Polyethylene	6 jars (3 x 2)	Pack #9*	
	500 mL WM Polyethylene	6 jars (3 x 2)	Pack #11*	
(Trace metals analysis	1 L WM Polyethylene	6 jars (3 x 2) Red Ring	Pack #10*	container is acid washed

TABLE IV (cont'd)
SAMPLING SUPPLIES - CENTRAL STORES

CHEMICAL SAMPLING CONTAINERS

***Restricted Use**

WM = Wide Mouth

Type of sample or	Container	Pack contents	Pack No.	Special Features analysis
Unchlorinated water rivers, lakes, wells;	250 mL Glass	4 bottles	Pack #7T or #7TF	Pre-sterilized, thiosulphate
Chlorinated water	Red Label	48 bottles (4x12)	Pack #8T or #8TF	added (foam pack)
	"	"	"	"

AQUATIC PLANT SAMPLES

Lake, river, raw water, wells	1 L Glass	6 bottles (3 x 2)	Pack #35	Express
Shoreline accumulations and scums	500 mL WM Glass	12 jars (3 x 4)	Pack #5	Use rubber cap liner (not foil if preservative added)

APPENDIX I

Enquiries regarding sampling and test procedures and the status of outstanding samples should be directed to the appropriate individuals listed below.

All samples received by the Laboratory Branch are assigned alpha-numeric codes according to sample type. As the analyses are completed, the results are entered into the computer (LIS system). When data for all tests have been entered, final reports are checked by senior staff and mailed. All original submission sheets are retained in the sample reception files for 18 months, after which they are destroyed. Laboratory staff are prepared to answer questions regarding the receipt and progress of samples but require the following information:

- a) Submission number and date of submission
- b) Name of sampling area as given on submission
- c) Field sample number and sample description
- d) Type of sample (e.g. water, river, sewage, industrial wastes, Great Lakes, algae, etc.)

NOTE: The submission number is the most important piece of information in tracking work through the Laboratory Information System. Please retain this record in a safe place and use it when requesting information as to the progress of your analytical work.

APPENDIX I (cont'd)

WATER QUALITY SECTION

Telephone - (416) 248-3512

Manager
*ERTF Representative

Larry Vlassoff
Vera Turner

(416) 248-3512 (B)
(416) 248-3512 (B)

(416) 924-0926 (H)
(416) 833-5969 (H)

The Section is responsible for the analysis of all major ions, nutrients and physical properties in water (including precipitation, surface water, groundwater, sewage and industrial wastes) as well as asbestos and radiochemical analyses. The section is also responsible for environmental microbiology tests.

General inquiries regarding results should be directed to the following staff based on sample classification.

Classification Name

LIS Sample Class

Contact Staff

Chemical:

-Chlorophyll
-Great Lakes
-Public Health Inspection
-Industrial Waste
-Precipitation
-River (surface water)
-Sewages
-Water (Ground/Domestic)
-APIOS Air Filters
-Stemflow
-Soil Leach - ARB (APIOS)

C
G
H
I
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S
W
AS, AL
SF
SX

(416) 248-3512
Bob Bobor
Stella Tracy
Stu Barnes
Vera Turner
Jenifer McBride
Stella Tracy
Ben Cheung
Stu Barnes
Jenifer McBride
Jenifer McBride
Stella Tracy

Microbiology:

-Drinking Water
-Lakes
-Nuisance Organisms
-Rivers and Wastes

MW
MG
MT
MR, MS

(416) 248-3000, 248-3008
Jim Clark/Steve Debricini
Michael Young/Susan Janhurst
Michael Young/ Garry Horsnell
Jim Clark/Geza Tanai

*ERTF = Emergency Response Task Force

APPENDIX I (Cont'd)

INORGANIC TRACE CONTAMINANTS

Telephone - (416) 248-3346

Manager
ERTF Representative

Barry Loescher
Liz Pastorek

(416) 248-3346 (B) (416) 927-0802 (H)
(416) 248-3346 (B) (416) 244-1023 (H)

The ITC Section provides analytical services which include the determination of elemental and mineral constituents in a variety of sample types such as soils, vegetation, air filters, fish, etc.

General inquiries regarding results should be directed to the following staff based on sample classification.

<u>Classification Name</u>	<u>LIS Sample Class</u>	<u>Contact Staff</u>	
Biomaterials	B	R. Sadana	(416) 248-3023
Fish	F	Ram Sadana	(416) 248-3775
Metals in Water	M	Prem Vijan	"
Fluoride Candles	FC	Brian Foster	(416) 248-3346
Hi-Vol Filters	HV	"	"
Anderson Filters	AF	"	"
Dustfalls	DF	"	"
Hi-Vol Particulates	HP	"	"
Dichotomous Metals	DC	"	"
Industrial Wastes	IW	Jim Pimenta/George Wood	"
Landfill Leachates	LF	" "	"
Sediments/Soil	SE, SO	Liz Pastorek	"
Sewage Sludge	SW	Jim Pimenta	"
Precipitation, Stemflow	AI, PI, SM	P. Vijan	"
Terrestrial Effects	TE, TX	Liz Pastorek	"
Vegetation	V	" "	"
Court Cases	CC	Rusty Moody	(416) 248-3346
Particulate Identification/Complaint	GR	" "	"
Electron Microscopy, Radiochemicals, Legal	E, RC, CC	" "	(416) 248-3346

APPENDIX I (Cont'd)

TRACE ORGANICS SECTION

Telephone - (416) 248-3846

Manager
ERTF Representative

Gerry Rees
Joe Osborne

(416) 248-3846 (B)
(416) 248-3846 (B)

(416) 491-7279 (H)
(416) 273-6579 (H)

The Section is divided into 5 main functional units:

The current analytical capabilities of each are:

1. Biota and Solids:

Currently the unit has capabilities for a broad range of extractable pesticides, herbicides, chlorophenols, PCBs, chlorinated benzenes, toluenes and higher molecular weight chlorinated industrial organics, and a limited range of other industrials such as phosphate ester plasticizers for hydraulic fluids.

2. Air Analysis:

Currently the Air Analysis unit has capabilities for sampling and analysis for a range of pesticides, PCBs, and chlorinated industrial chemicals in the vapor phase. Limited capacity (4-5 samples per day) is available for analysis of organic vapors, (both chlorinated and non-chlorinated compounds) in ambient air by absorbent trap-thermal desorption.

This method is being extended to analyse chlorinated species at much higher sensitivities. The unit has the capability for limited non-automated analysis of gas samples for gaseous hydrocarbons, sulphur gases, and chlorinated hydrocarbons.

3. Landfill/Hazardous Waste Unit:

This unit has two functions: (a) co-ordination of all LSB landfill investigations, and determining related organic constituents, and general tiered testing; (b) the analysis of solids and hazardous/high concentration liquid wastes for toxic organics.

APPENDIX I (Cont'd)

TRACE ORGANICS SECTION

Telephone - (416) 248-3846

4. Effluents/Advanced Instrumentation Unit:

This unit has two main functions: (a) to provide analytical services for the measurement of trace organics in municipal and industrial effluents, leachates, etc.; (b) to provide specialized advanced analytical instrumentation services to the rest of the section.

Based on the above criteria, general inquiries regarding trace organic results should be directed to the following staff based on sample classification.

<u>Classification Name</u>	<u>LIS Sample Class</u>	<u>Contact Staff</u>
		(Phone (416) 248-3846)
Sediments/Soils	PS	George Crawford
Biomaterials (not fish)	PB	"
Biomaterials (fish)	PF	"
Vegetation	PV	"
Air	PA	Joe Osborne
Landfill (any)	CH, PL	Ed Adamek/George Hendry
Water (any)	PW	Yvonne Jones
Trade Wastes	PT	Pat Baulu
XAD resins	WX	Wendy Moss

APPENDIX I (Cont'd)

TRACE ORGANICS SECTION

Telephone - (416) 248-3846

5. Organic Characterization/ Identification Unit:

The main function of the section is the characterization of organic substances and the positive identification of individual organic compounds in all types of environmental samples.

<u>Parameter Class</u>	<u>LIS Sample Class</u>	<u>Test Code</u>	<u>Contact Staff</u> (Phone (416) 248-3469)
Solvent Extractables	SP	SOLEXT	George Wyhovszky
Tannins	"	TANN	"
Tracer Dyes	"	TDNAFL	"
	"	TDRHOD	"
Complaints	"	OSCOMI	"
Identification/Characterization	"	IDGW	"
Problem Assessment	"	PBASSP	"
Petroleum Hydrocarbons	"	OSPHCX	Mira Petranovic

**APPENDIX I (Cont'd)
DRINKING WATER ORGANICS SECTION**

Telephone - (416) 248-7484

Manager	Helle Tosine	(416) 248-7484 (B)	(416) 766-7409 (H)
ERTF Representatives	David Hall	(416) 248-3939 (B)	(416) 791-2302 (H)
	Vince Taguchi	(416) 248-3755 (B)	(416) 848-8023 (H)

General inquiries, should be directed to the following staff based on parameter:

<u>Parameter</u>	<u>LIS Sample Class</u>	<u>Matrix</u>	<u>Scan</u>	<u>Contact Staff</u>
Polychlorinated dibenzodioxin and Polychlorinated dibenzofurans	PX	water, fish/biota incinerator emissions soils/sediments special projects		R.E. Clement ((416) 248-3840)
PCB's chlorinated aromatics organochlorine pesticides organophosphate pesticides chlorinated phenols phenoxy herbicides carbamates triazines phenylureas trihalomethanes volatile/purgeable organics base/neutral/acid EPA extractables	OW	- drinking, ground and surface waters	OWOL " PEOP OWCP " OWCAR PETRI PEUR OCOHVI OPOPUP (OPOPRO) OPOBNO " OPOAXO "	D. Hall ((416) 248-3939)
Parameter Class Mass Spectrometry, GC/MS GC/MS Volatiles Extractables Speciated Phenols Special PAH's	MY		PBASMY PBVOL PBEXT OAPHNX OAPAHX	Vince Taguchi ((416) 248-3755) Dave Wang ((416) 248-3755)

APPENDIX I (Cont'd)

AQUATIC ECOSYSTEMS SECTION (WATER RESOURCES BRANCH)

	<u>LIS Sample Class</u>	<u>Contact Staff</u>
Aquatic Biology Unit: Phytoplankton, Zooplankton, Periphyton	GH	Gord Hopkins (416) 248-3058 Ken Nicholls "

LABORATORY COMPUTER SYSTEMS - QA/QC SECTION

Manager		Paul Roberts (416) 248-7442
LIS/SIS Coordinator		" " "
Quality Assurance/Quality Control		Don King "

SHIPPING AND RECEIVING

Central Stores		Ron Harrison (416) 248-3051
Sample Bottle Supply		Julian King "

LONDON REGIONAL LABORATORY

Chief Laboratory Services		Dave Glutek (519) 681-3600
Chemistry		Walter Cook "
Microbiology		Gary Palmateer "

THUNDER BAY REGIONAL LABORATORY

Manager		Jim Stasiuk (807) 475-1275
Chemistry		Patrick Leung "
Microbiology		Stuart Irwin "

APPENDIX I (Cont'd)

	<u>LIS Sample Class</u>	<u>Contact Staff</u>
KINGSTON REGIONAL LABORATORY		
Chief Laboratory Services		Stan MacBeth (613) 549-4000
Chemistry		Dave Ferguson "
Microbiology		Art Ley "

APPENDIX II

The following addresses should be used when shipping samples to the various laboratories:

a) CENTRAL REGION - MAIN TORONTO LABORATORY

Ontario Ministry of the Environment,
Central Stores,
125 Resources Road,
Highway 401 and Islington Ave.,
Toronto, Ontario.
M9W 5L1

Mailing Address:

Ontario Ministry of the Environment
Central Stores
P.O. Box 213
Rexdale, Ontario
M9W 5L1

b) SOUTHWESTERN REGION - LONDON LABORATORY

Ontario Ministry of the Environment,
Southwestern Regional Laboratory,
985 Adelaide Street South,
London, Ontario.
N7E 1V3

c) NORTHWESTERN REGION - THUNDER BAY LABORATORY

Ontario Ministry of the Environment,
Thunder Bay Regional Laboratory,
421 James Street South,
Thunder Bay, Ontario.
P7C 5G6

d) SOUTHEASTERN REGION - KINGSTON LABORATORY

Ontario Ministry of the Environment,
Southeastern Regional Laboratory,
133 Dalton Street,
Kingston, Ontario.
K7L 4X6

Further enquiries regarding container requisitions, shipping, etc, should be directed to Central Stores in Toronto (Telephone 248-3051).

APPENDIX III
RESPONSIBILITIES OF LABORATORY STAFF FOR LEGAL SAMPLES

A. SAMPLE RECEPTION

1. Legal samples must be received by a Provincial Analyst or Provincial Officer. If a submission does not arrive at the Laboratory when expected a Provincial Analyst/Officer will contact the appropriate field staff.
2. A Provincial Analyst/Officer must check each submission for the following:
 - a) The number of samples and the number of containers received at the Laboratory match those shown on the Request for Analysis forms.
 - b) All seals, sample descriptions, dates and times, on the Request for Analysis forms must match those on the containers.
 - c) All samples are in appropriate containers and contain the appropriate preservatives.
 - d) The samples arrived at the Laboratory within the allowable time for the specified types of analyses.
 - e) The shipping way bills are present if the samples were not delivered by hand.
 - f) A description of the problem is included in the submission.
 - g) All samples suspected of containing hazardous materials are properly labelled. Chemical data sheets should accompany the submission or be forwarded to the Laboratory as quickly as possible.
3. A Provincial Analyst/Officer will contact the sender to report any differences between what is shown on container labels and what is shown on the Request for Analysis forms. Analysis of these samples will be withheld until corrections are made and initialled by the field staff.
4. A Provincial Analyst/Officer may reject all or part of a submission for any of the following reasons:
 - a) The submission will not be used in legal proceedings. (Treat as a normal submission).

APPENDIX III (Cont'd)

- b) Samples not received within the allowable time or storage conditions unacceptable.
- c) Improper preservative used.
- d) Samples in improper containers.
- e) Containers, labels, etc do not match the Request for Analysis forms.
- f) Samples taken improperly, i.e. non sterile technique.

Any time a Provincial Analyst/Officer rejects any part of a submission, that Provincial Analyst/Officer will immediately contact field staff by telephone, and follow-up with a written explanation for the sample rejection.

5. A Provincial Analyst/Officer may withdraw test requests after prior consultation with the sender for any of the following reasons:
- a) Tests inappropriate.
 - b) Samples not received within allowable time.
 - c) Improper preservative used.
 - d) Samples in improper containers.
 - e) Insufficient sample volume.
 - f) Methodology not available.
6. After accepting all or any part of a submission, the Provincial Analyst/Officer will perform the following tasks.
- a) Assign Laboratory sample numbers to each sample accepted. All containers for a particular sample will receive the same Laboratory sample number. This number will have the form:

CC ww-nnnn
where CC = sample class code for Legal samples
ww = week number (2 digits)
nnnn = sample number (4 digits)

The full six digit code must be used.

APPENDIX III (Cont'd)

- b) Number all sample containers.
- c) Write this number under Lab Sample number for the appropriate sample on the Request for Analysis form.
- d) Change the sample program code to 77.
- e) Change client Code 1 to CLWBM. Delete all others.
- f) Change Report to (name) to W. B. Moody.
- g) Write in the sample type on the Request for Analysis form beside the appropriate sample.
- h) Write in or alter test requests on the Request for Analysis form as needed for each sample.

NOTE: The Analyst may need to contact other Laboratory staff in order to assign the proper sample type and test codes.

- i) Check that all LIS forms are complete.
- j) Update sample log in Sample Reception.
- k) Complete the Case Submission/Sample Receiving Report and sign it.
- l) Prepare photocopies of all LIS forms and Case Submission/Sample Receiving Report for the sender, LIS data entry staff and each other Provincial Analyst who will receive any part of this submission.
- m) Give the submission to LIS data entry staff personally for processing.
- n) Mail or give a copy of the LIS forms and Case Submission/Sample Receiving Report to the submittor.
- o) Open a file for this submission. Put all original LIS forms, the original Case Submission/Sample Receiving Report, seal ends or tags and shipping forms into this file.
- p) Write the submission number, Laboratory sample numbers, submittor and sampling location on to the Index. Indicate individual sample destination within the Laboratory.

APPENDIX III (Cont'd)

B. SAMPLE STORAGE

1. After a Provincial Analyst receives and accepts a Legal submission, the Laboratory will take responsibility for the submission and for maintaining the Chain of Custody.
2. The Laboratory will provide a lockable, refrigerated Property Room for Legal submissions.
3. Keys for the Property Rooms will be controlled by a Provincial Analyst responsible for Legal samples in each Section (i.e. the Section Representatives).
4. Samples will be transported from Sample Reception directly to the appropriate Property Room by the Provincial Analyst who received the samples. Samples will be grouped according to Section as well as possible.
5. A Legal Sample Property Room Log Book will be kept.
6. Each submission will be listed in this Log Book on its own page. Each time samples are removed from or returned to the Property Room this Log Book will be updated and signed by the appropriate Provincial Analyst.
7. Samples will be kept in the Property Room when not being analyzed.
8. Samples are the responsibility of the Provincial Analyst who removes them from the Property Room. Continuity of possession must be documented.
9. Six months after the issuing of the final report, the investigating officer will be contacted. If a court date has been set, the Laboratory will maintain custody of the sample until after the court case and dates for appeal have expired.
10. Written authorization must be received by the Laboratory prior to discarding or returning Legal samples to the sender.
11. The Property Room Log Book will be updated to indicate when the samples were discarded.

C. ANALYSIS OF LEGAL SAMPLES

1. Each Provincial Analyst will maintain a bound, numbered journal or equivalent in which all records pertaining to the analyses of Legal samples will be kept. The journal should contain the following information for each Legal submission:
 - a) the time and date of receipt of the Legal samples from the Section Representative. The name of that Section Representative.

APPENDIX III (Cont'd)

- b) The time and date the Legal samples were returned to the Section Representative. The name of that Section Representative.
- c) A physical description of each sample.
- d) The sample number.
- e) The date and time at which each analysis was started.
- f) Notes on any deviations from official Ministry of the Environment methods. If an official Ministry of the Environment method does not exist, then a method description should be given.
- g) The technicians, if any, who performed the analyses.
- h) All results and observations obtained.
- i) The date and time at which each analysis was completed.

NOTE: All entries must be in chronological order and must be dated and signed by the Provincial Analyst.

- 2. The Section Representative will discuss the required tests with the appropriate Provincial Analyst in his Section. The Section Representative will remove the samples from the Property Room and transfer them to this Provincial Analyst.
- 3. The Property Room Log Book will be updated when the samples are removed or returned.
- 4. All analyses performed should employ official Ministry of the Environment methods or approved modifications of these official methods. A copy of these methods will be maintained in the Quality Assurance Officer's Office.
- 5. All Quality Control procedures required for a test will be performed and judged to be in control prior to the analysis of Legal samples.
- 6. The Legal samples should be analyzed immediately after the Quality Control standards.
- 7. Where applicable, a sensitivity check and a blank will be analyzed immediately after the Legal samples.
- 8. The Provincial Analyst will initial the sample container label to indicate that the sample has been analyzed by him or her.

APPENDIX III (Cont'd)

9. The results for each test will be checked by the Provincial Analyst who has responsibility for that test. The Provincial Analyst's signature will verify that the sample and Quality Control results are correct to the best of his or her knowledge.
10. All computer printouts, calibration curves, etc. used will be stored in the file for that submission.
11. A copy of the Quality Control results may be given to a Section Quality Assurance representative for verification. If so, this Quality Assurance representative will produce a Certificate of Quality Assurance to verify that the Quality Control procedures were done and that the test was in control.

D. REPORTING RESULTS

1. No Legal Sample result should be entered into the LIS, only the remark !CC.
2. All Provincial Analysts who have performed any analyses for a particular submission, will produce their own Certificate of Analysis. Results should not be reported unless the Quality Control procedures were done and the test was in control.
3. Results must be reported to the appropriate number of significant figures.
4. All Certificates of Analysis will follow the approved format:
 - 1) "Certificate of Analysis" will appear on the report.
 - 2) Page ___ of ___ will appear on each page.
 - 3) The date and signature of the Provincial Analyst must appear on the report. The name of the Provincial Analyst should also be typed on the report.
5. Any charts, photographs, etc. used in reports must be produced in at least triplicate.
6. All reports for a submission will be reviewed by the Section representatives committee.
7. Reports may be sent to the chief investigating officer without review provided they are stamped "Interim Report - for information only".
8. All Certificates for a submission will be collected and forwarded to the submittor as one report.
9. The submission will be approved on the LIS by one of the Legal Samples Co-ordinators.

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A guide to the collection and
submission of samples for
laboratory analysis.

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